MAGAZINE

OF

ZOOLOGY AND BOTANY.

ORIGINAL COMMUNICATIONS.

I.—*On the requisites necessary for the advance of Botany.* By the Rev. J. S. Henslow, M. A., Professor of Botany in the University of Cambridge.

That we are, as a nation, behind our continental neighbours in almost every branch of scientific research, is an assertion which has often been made of late; and has been more formally pronounced in several of the reports which have been read within the last three years at the anniversary meetings of the British Association. That this censure may be extended to botany, is rendered probable by the fact, that we have had no journal devoted to this science, and conducted on strictly scientific principles, which has ever met with sufficient encouragement to allow of its being carried on for several years together. But, in admitting the fact of the inferiority of our scientific character, as a nation, we must still venture to assert the claim of Great Britain to the possession of some botanists whose attainments and reputations are on a par with those of the highest enjoyed by their continental brethren. But in speaking of our national inferiority we do not allude to the attainments of a few; and the want of encouragement which such periodicals as the Annals of Botany formerly, and the Botanical Miscellany, and Journal of Botany, more recently, have met with, clearly prove the low ebb at which botany as a science stands among us. It is true that the two last mentioned periodicals are still continued under the title of a "Companion to the Botanical Magazine," but this very fact confirms our assertion. It may perhaps be thought that we make no slight preten-

sions to the character of a botanical nation, whilst such publications as the Botanical Magazine and Botanical Register have so long received encouragement and support; the first of which has now been regularly published for a series of more than forty years. The circumstance of these works being edited by two of our most eminent botanists speaks at once to the importance of their contents, and is an ample guarantee of their being replete with the best and most strictly scientific details. But it will scarcely be denied, that excellent as these publications undoubtedly are, their chief and really efficient support is derived from their horticultural rather than from the botanical portion of their subscribers. Hence it happens that they must each, to a certain extent, sacrifice the character of strictly scientific publications to suit the taste of their horticultural readers. We do not affect to complain of this, we are merely stating the fact as illustrative of our assertion. The Magazine of Natural History, published by Mr Loudon, and which has done much towards spreading a taste for natural history generally, can scarcely be considered an exception; for though it undoubtedly contains several valuable and truly scientific memoirs, yet by far the greater portion of its pages do not bear this character, nor can it in this respect be compared with such foreign journals as the "Annales des Sciences Naturelles," the "Allgemeine Botanische Zeitung," &c. In England, we find our leading naturalists generally prefer sending their more important communications to some public scientific society, in whose transactions they may appear to greater advantage than in the pages of a magazine. Still, it must be allowed that a regular periodical affords far greater facilities for the immediate dissemination of discovery in science than the transactions of any society,—such a periodical may further be made especially useful in stimulating to exertion those persons, and they form a numerous class among us, who are content with loitering about the threshold of science, and merely amusing themselves with the results attained by others. Could they be persuaded to engage in some branch of original research they would much increase their means of enjoyment, and at the same time be adding to the general stock of human knowledge. Among all nations we assuredly possess the means of accomplishing more for botany than any other; and we should easily take precedence of all others in this science, if we could persuade those who content themselves with skimming the surface to plunge a little deeper. In what other country do we find so many engaged in horticultural and floricultural pursuits. There is scarcely a town of any note without its horticultural society, and many now possess

their botanical and horticultural gardens. But if such great interest is felt in the mere cultivation of fine flowers and handsome fruit; if the mere gratification of the eye or of the palate can stimulate so many to the laudable exertions which are made in support of these societies, with their costly medals, and numerous prizes and extra prizes, how much deeper interest would they feel if they would once consent to add somewhat of a more intellectual character to their scheme, and contrive to occupy their thoughts with the engaging pursuits of scientific botany, or attempt a few of those important experiments which might be turned to account in establishing the leading principles of vegetable physiology. To those who have never paid any attention to speculations of this kind, but have been hitherto satisfied with merely admiring the forms and colours of the splendidly beautiful flowers which result from high culture and successful art, there often appears a degree of mystery or difficulty hanging over such researches which deters them from attempting anything partaking of a really scientific character. It is undoubtedly true that something like an intellectual exertion is required to master the first principles of this science, and to become acquainted with the technical nomenclature necessarily established for the purpose of facilitating our advance. But what is this when compared with the higher stretch of thought requisite to master the rudiments of abstract science. To obtain a knowledge of a science of observation, like botany, we need make very little more exertion at first than is required for adapting a chosen set of terms to certain appearances of which the eye takes cognizance, and when this has been attained, all the rest is very much like reading a book after we have learnt to spell, where every line and every page affords a fresh fund of intellectual enjoyment. It is on these grounds that we would particularly recommend every horticulturist or other person any way occupied in the cultivation of plants, to increase his stock of intellectual enjoyment by conducting his pursuits in connection with scientific inquiry.

Great advances have been made within the last half century in various departments of this science, in the classification of plants upon sounder principles than those which had so long been predominant; in obtaining more accurate details of their anatomical structure, owing to the greatly improved condition of the microscope; in the more perfect analyses which organic chemistry has furnished of the immensely numerous products of vegetation; and lastly, in certain generalities relating to the geographic distribution of plants. But still we are very far removed from perfection, either as relates

to the discovery of that natural system upon which the great Author of Nature has planned the works of creation, or as regards the detection of those laws by which the several functions of vitality are regulated. In all probability, there is ample scope for the accumulated observations of many generations yet to come, before we can expect that either systematic botany or vegetable physiology will take up their position by the side of the exact sciences. In the present state of our knowledge, there is perhaps most to be expected, towards making some decided step in advance, from those botanists who have it in their power to attend to the cultivation of plants in all its practical details. So far as any thing can be expected from direct observation on the structure of individual specimens, there are plenty of willing workmen of the most able class both at home and abroad, but there is a decided want of scientific experimenters, and until further information can be obtained from the positive results of experiment, we may scarcely hope to establish on a very firm basis, any of the more important principles of the science. Notwithstanding that every classification of plants proceeds upon the predetermination of the specific characters of individuals, hundreds of examples might be produced in proof of the real ignorance of our very first rate botanists, as to the limits within which a species may vary. In some cases they are tolerably agreed about arranging as a single species numerous forms possessing a marked dissimilarity; and here they have been guided either by the results of experiment, or they have had the opportunity of seeing so many intermediate forms between two of the most marked varieties, as to leave no doubt that all were referable to a common origin. There are, however, a multitude of instances where the resemblance which two individuals, of somewhat different form, in certain respects, is decidedly striking, and which are nevertheless almost universally considered to belong to different species. There is, in short, no law whatever hitherto established, by which the limits of variation to a given species can be satisfactorily assigned, and until some such law be discovered, we cannot expect precision in the details of systematic botany. In this respect the science is pretty much in the position which mineralogy occupied before the discovery of the laws of crystallography; mineralogists were frequently in the dark as to what crystals were to be included under one species, and they knew almost nothing of the numerous forms in which any given species might occur, until they were actually found to exist. But now, a single crystal at once puts the mineralogist in possession of the primitive form of the species, and he can calculate "à priori" the possible forms under which it may

occur. Perhaps we may be allowed to suspect some analogy between the primitive forms of crystals, and those normal or typical forms which may be assigned to different species of plants, by the application of such rules of morphology as already appear to a certain extent satisfactorily established, viz. the partial suppression or complete abortion of particular organs, and the adhesion of others. Although no precise laws have hitherto been discovered in botany, which assign the limits of variation to a given species, some approximation to them might possibly be expected, by attending more strictly than seems to have been customary to the principles of analogical reasoning. Thus, when we find the admitted varieties of one species ranging through certain peculiarities of structure, it is reasonable to suppose, that if we now find two other individuals of the same genus, which do not differ more, or so much from each other as the former two, then these ought also to be considered as varieties of a single species. In the determination of species, our most eminent botanists seem frequently to be acting against their own judgment, and compelled to describe as distinct what they have little or no doubt themselves, ought to be considered as identical. Hence they are perpetually qualifying their descriptions with such phrases as these, "Priori nimis affinis,"—"vix et ne vix distincta,"—and even after this a third species is still described as "duabus prioribus exacte intermedia!" It is perhaps extremely difficult to form any decided opinion about the limitation of species, and we find some persons who, instead of wishing to multiply them beyond their due limits, are inclined to run to the opposite extreme, and believe that there is no such thing as distinct species at all; a clear proof again that we are in want of multiplied experiments, undertaken by careful and scientific observers. But we shall never make any progress towards solving the problem, if we continue dissatisfied with the positive results of experiments, merely because they happen to militate against our preconceived notions; and though a proper degree of caution ought always most unquestionably to be exercised, before we admit even the most positive evidence in favour of a new and startling fact, yet there can be very little value assigned to any mere assertions which may be made contradictory of such a fact, even though they should be partially supported by the negative results of direct experiment. Although several years have passed since Mr Herbert proved by experiment that numerous varieties of Primrose, Cowslip, Oxlip, and Polyanthus, might originate from the seeds of a single plant, agreeably to the opinion of Linnæus, who considered them all to be mere varieties of the same

species,—and although the fact was partially confirmed in a notice in the Magazine of Natural History some time ago, our systematic botanists are not yet convinced of the truth of these results, though it does not appear that they have weakened their authority by any appeal to experiment, the only test which can here be considered admissible. Although it has been shown experimentally, that plants of Anagallis arvensis can be raised from seeds of Anagallis cœrulea, agreeably to the opinion of De Candolle in the Botanicon Gallicum, who considers them mere varieties of the same species, and although nothing satisfactory has been brought forward contradictory of this opinion, the more general feeling appears still to be adverse to their being included under one species. These remarks are not made with the view of inducing those who are sceptical as to the accuracy of these experiments, to change their opinion, but if possible to persuade them to repeat the experiments and record the results. Other cases might be mentioned where similar experiments have lately been prosecuted on the Continent, and the results obtained have justified the propriety of a reduction of species; but they have not as yet been conducted on a scale sufficient to warrant any hope of our deducing a general law from them. For the present then, and until some such law is established, we must remain content with limiting our species by those empirical rules which multiplied observation alone affords us, and from the examination of every variety that we can lay our hands upon. In their restriction of species, different botanists are influenced by very opposite considerations.—Some prefer multiplying their number to the utmost extent, whilst others, and these form the less numerous class, would reduce nearly all doubtful cases to the rank of varieties. To the opinions of the latter class we are most decidedly favourable, and it is with great satisfaction that we find the following remarks upon this subject in the preface to the excellent Flora of the Indian Peninsula, by Dr Wight and Mr Arnott,* "We shall perhaps be severely censured for cutting down species. We have all along considered it as trifling with nature to separate species on slight or variable grounds, nor could we ever understand the 'cui bono' for which so much ingenuity in splitting hairs has been wasted. Before we determined what was a species, we examined with care numerous specimens from the same and different localities; and so far we have had an advantage over many other of the European botanists who have described Indian plants, they having only seen one or two isolated specimens. Numerous observations, too, were made on the plants in their natural situation, the result of which went to

* P. 21.

prove, what we have frequently endeavoured to enforce by examples throughout the present volume, that no precise shape of leaf or quantity of pubescence is of any value, although both of these seem in each species to be limited within certain variations. With regard to varieties, we have seldom distinguished any, unless well marked and tolerably constant; we are aware, indeed, that these correspond to what some naturalists call species, but our own observations have convinced us, that varieties and forms, as well as species, may be constant in similar situations, and even in widely different situations, for many years, if raised from seeds either obtained from the original locality or from cultivated plants; the cultivated cerealia and garden vegetables ought to lead to such an hypothesis without any additional proof."

The extent to which uncertainty prevails on this question, cannot be better shewn than by the remarks of Dr Lindley, in the new edition of his Synopsis of the British Flora.* Here we find this distinguished botanist, who has devoted so much attention to the two genera Rosa and Rubus, confessing himself incapable of deciding whether certain forms in the latter genus constitute one, three, or fourteen species. "When I first began to attend to this very difficult subject, I could not avoid remarking that the same distinctions and peculiarities which had led to the establishment of many of these (species), would also separate many other forms of the genus; and it appeared to me that, to be consistent, we ought either to reduce the whole to *Rubus suberectus, fruticosus, corylifolius,* and *cæsius,* or to distinguish a considerable additional number of such species as Smith, by the advice of his correspondents who had specially occupied themselves with the subject of British plants, had been induced to admit."—"I accordingly advanced the number to twenty-three; certainly not from any expectation that such species were either genuine, or likely to prove permanent, but with a view of following out the *recognized* principles of distinction, and showing whither they must inevitably lead."—"It has led me to reconsider the subject very carefully, and to examine with more attention the nature of the principles upon which the modern and *recognized* species of Rubus have been established; I have also had six years of additional experience; and I am bound to declare, that I can come to no other conclusion than that with which I have first started, namely, that we have to choose between considering the four first named plants the only genuine British species, or adopting, in a great measure, the characters of the learned German botanists, (Weihe and Nees von Esenbeck,) who have so much distinguished themselves

* P. 91.

in the elaboration of the genus. So clear is my opinion upon this point, that, if it had been possible to prove the four species to which I have alluded to be themselves physiologically distinct, I should at once have reduced all the others to their original places; but as it is in the highest degree uncertain whether *R. fruticosus, corylifolius* and *cæsius* are not as much varieties of each other, as those which it would be necessary to reject, I have thought it better to steer a middle course, until some *proof* shall have been obtained either one way or the other. Accordingly, I have taken *R. fruticosus, corylifolius, cæsius* and *suberectus* as heads of sections, and I have assigned them characters which may be considered either as sectional or specific, according as the evidence may ultimately preponderate; and I have arranged as species under them those forms which are the best marked and the most clearly distinguishable. This will bring the genus *Rubus* somewhat into the situation of *Rosa;* in which, I fear, we must be satisfied with leaving it for the present."

We have dwelt somewhat longer upon this topic than to many may seem advisable, but we feel so thoroughly persuaded of the very great importance of some exertions being made for the purpose of obtaining a better criterion for the descrimination of species than the mere empirical rules at present practised, that we trust to be excused for attempting to direct the attention of all those who have it in their power to follow up the subject experimentally, to this very desirable object.

Although we must not hope to attain that degree of perfection in systematic botany, which would probably be the immediate result of our detecting the laws which regulate the limitation of species; yet much has been, and much more may unquestionably be achieved, through the means actually in our power, towards distributing plants into natural groups, and pointing out the relations which such groups bear to each other. Nothing has of late years contributed so much to the progress of systematic botany, as the publication of separate monographs of genera, tribes, and orders by different individuals. The number of species already known is so great, that no single botanist can ever hope to examine in minute detail more than a small fraction of them. He may, however, become thoroughly acquainted with the leading characteristics of every order, and of their subordinate groups, and many of their genera, by merely examining for himself a portion of the species which they each include. But if, in addition to his general studies, he also directs his attention more especially to some particular group, for the purpose of completely

elaborating the minutest details in the history of every species it contains, he cannot fail of making some observations which may assist in approximating more closely to the discovery of the natural system. Independently of any formal attempt of this kind, every one who examines for himself is continually stumbling upon something or other, which, if it were recorded, would assist in refining our systematic arrangements ; and such minor observations may always find an appropriate place in the pages of a scientific magazine, when they might be considered too trifling for publication in the Transactions of any scientific society.

The greatest desideratum in scientific botany next to obtaining a law for the determination of species, is some criterion for establishing the relative values of those different groups into which species are collected, under the titles of Genera, Tribes, Orders, &c., compared with some of the best defined and most extensive natural groups, such as the Compositæ, Leguminosæ, Gramineæ, &c. There are many others, considered as Natural Orders, which seem to possess very slight claims to be ranked with them as groups of equal value. The tendency at present appears to be more generally in favour of subdividing those which have been previously established, than of connecting such as are most nearly allied. In the excellent publication of Nees ab Esenbeck, the " Genera Plantarum Floræ Germanicæ," this principle is carried to an extreme, and so far as it serves to point out the distinct groups, however numerous, into which species may be collected, nothing can be better. The next requisite is to know how to distribute these minor groups into larger ones, which the author has also effected with great judgment. But still in the present state of the science, we have no certain knowledge whether the several groups bearing the same name are truly of the same value. The difficulty which at present attends the construction of natural groups of similar value is forcibly exhibited by Mr Bentham in his excellent and elaborate monograph on the Order Labiatæ. Under his genus Melissa, in which he includes Calamintha, Acinos, and Clinopodium of other authors, he observes,* " Whether the characters be derived from the parts of fructification or from general habit, the circumscription of this and the nearly related genera of Hedeoma, Micromeria, Gardoquia, and Keithia, is attended with much difficulty ; and it might, perhaps, have been a clearer classification, if the whole had been considered as forming one extensive genus, as in the case of Salvia, Hyptis, Teucrium, &c. The relative proportion, direction, and size of the upper and lower teeth of the calyx, the hairs at the orifice, the proportion of the corolla to the ca-

* P. 384.

lyx, the fertility or sterility of the upper stamina, the relative situation of the two lobes of the anthers, the form of the extremity of the style, and even the general direction of the stamina—characters which, in the rest of the tribe, are more or less constant—are remarkably uncertain in the present series, and seldom correspond with the differences of habit and inflorescence. These differences, on the other hand, are too vague and difficult of definition to be available for the purpose of generic distinctions. Whilst, therefore, I have endeavoured, as in other instances, to take the organs of fructification as the bases of generic, and the inflorescence and habit of sectional characters, I am fully aware that there are many species which may be nearly as well placed in either of two or more sections or genera; but every day brings further proof of the impossibility of reducing nature to any thing like mathematical accuracy."

To pass from the requisites necessary to secure the advance of scientific botany, to those which may be considered essential to the progress of botanical physiology, we have a wider field open, and to a much more numerous class of observers, than the one we have already discussed. This part of our subject is in its first infancy, and it is in the power of any one without much difficulty, to make himself master of the details necessary to place him in possession of the leading facts hitherto ascertained, and of the nature of those difficulties which impede the progress of this department of botany, and all this may be attained without the necessity of his being previously forced to master the details of systematic botany. It is here that recourse to experiment is of paramount consideration. Although some knowledge of vegetable anatomy may be requisite, much may be done in researches of this kind without any minute acquaintance with the details of the internal structure of plants, or the necessity of attaining to any great degree of skill in the use of the microscope. Vegetable anatomy is itself comparatively far behind that of animals, and there are many points of primary importance still under dispute. Notwithstanding the many discoveries which have been made by the great skill of our modern miscroscopic observers, very little is known of the comparative anatomy of different genera, and indeed little more of the internal structure of plants, generally, than the forms and appearances presented by the several elementary organs of which the vegetable tissues are composed. We have accurate delineations of a great variety of the vesicles in the cellular tissue, of the ducts and tracheæ composing the vascular, &c., but very little information has hitherto been obtained as to the precise offices which these several organs are destined to

execute. A great multitude of dissimilar products are elaborated and secreted by some one or other of these organs, but we know little or nothing concerning which of them it is that produces each separate result. Even the manner in which the imbibed nutriment is conveyed from the root to the leaf is not satisfactorily determined—the functions of the leaf itself are not so well established as to be placed beyond all doubt; or rather, the manner in which these functions are performed is not yet well understood. The researches of Robert Brown and Ad. Brogniart have settled, beyond dispute, some of the most important preliminary phenomena attending the fertilization of the ovule, but the ultimate facts are still to be discovered, and at present we have only conjectures and opposite hypotheses between which we are to choose when we would inquire how the embryo may have originated, after the pollenic tubes have penetrated down the style into the ovarium. It seems indeed to be all but proved that these tubes really attach themselves to the foramen, a circumstance which would appear to favour the somewhat mechanical theory of the introduction of the pollenic granules themselves into the nucleus. Hitherto, the fact of a general circulation of the proper juices, or latex, in plants, through a peculiar system of anastomosing vessels, has only engaged the attention, or even met the observation of very few persons, except the original discoverer. The mode in which the assimilation of new materials takes place during the development of the trunks of trees cannot be considered as satisfactorily determined; the most favoured theory on the subject (that of Du Petit Thouars) requiring the confirmation of direct experiment, as well as the removal of very serious objections.

But besides such inquiries as these, which need great delicacy of manipulation and considerable experience in the use of the microscope, there are many others which are within the reach of every one—like that question, so important in agriculture, lately started by De Candolle, whether the excretions from the roots do not deteriorate the soil, as respects other plants of the same or allied species, but actually improve its qualities for those of different families. The agriculturist who wishes to prosecute this, or any research of interest in a physiological point of view, must remember the sound advice which De Candolle has given—always to perform a series of comparative experiments, by which means alone he can hope to check that liability to error, against which the most accurate judgment is no safeguard, whilst it relies only upon its natural unassisted powers.

In thus briefly noticing some of the more important topics which

might advantageously engage the attention of those who wish to promote the progress of botany, beyond the stage at which it is now arrived, we are by no means inclined to undervalue the labours of those who content themselves with merely reviewing the steps through which it has already advanced, and may not be disposed to travel out of the beaten track. Even those who confine their attention to the local botany of some well known district, have it in their power to improve our knowledge of individual species, and teach us something more than may be already known of their distribution and properties. Notwithstanding the perfection to which the knowledge of the native plants of England has arrived, there is unquestionably much that is yet to be done before we can expect to obtain a precise account of our indigenous Flora. Not to mention those parts of Ireland which hitherto have never, or scarcely ever, been trodden by the foot of a botanist, the mountains of Scotland are still producing fresh novelties to reward the ardour of those who accompany our Northern Professors in their annual excursions. Although we cannot expect very numerous additions to be hereafter made to our phanerogamic botany, there must still remain many species unnoticed among the lower tribes of Cryptogamia, especially among the obscure families of Fungi. Now indeed that we possess a complete Flora of Great Britain, since the recent publication of the second part of the fifth volume of the English Flora, from the accurate pen of Mr Berkeley, we may expect daily additions to be made to our knowledge of the Fungi, from various parts of the country, so soon as they shall have been more carefully searched under the direction of this new guide. But it is not so much the discovery of new species which is likely to make us more thoroughly acquainted with the real character of our Flora, as the determination of the precise circumstances under which the old ones occur. No one can deny that our strictly indigenous Flora has been greatly augmented by the importation of many exotic species, which have become more or less perfectly naturalized, and must now necessarily be considered as forming part of the wild and native vegetation of the country. It is, then, of first rate importance to the progress of Botanical Geography that we should determine, as nearly as possible, which are the truly indigenous and which the naturalized species.—Formerly, indeed, and perhaps the time is not quite gone by, British botanists were proud of swelling the local Floras of a given district by the addition of any chance specimen which they happened to meet with, and thought very little of stating the circumstances under which a little reflection or inquiry might have satisfied them,

it was most probably brought within the sphere of their notice. Sounder views of the requirements of science ought to satisfy us, that he who can show good reason for expunging a plant from the list of our strictly indigenous species, does some real service towards the attainment of truth, whilst he who needlessly swells his catalogue by the admission of a species on doubtful authority, throws a decided obstacle in its way, and surely doubly puerile is that vanity, by which some are said to have been influenced, who have one year sown the seeds of a rare, or even of an exotic species, in an unfrequented spot, that they might become the earliest discoverers of a *new native!* There is enough in all conscience to puzzle us in our search after truth, without the problem being thus complicated by the intentional introduction of error. For the purpose of comparing their own observations of the geographical range and distribution of our native species with what is already known on these subjects, our local botanists may consult the recent treatises of Mr Watson with the greatest advantage. Attention to these and other like points of general interest will add a very considerable charm to the attractions which the study of botany possesses, even to him who is content with merely collecting and arranging his specimens. For we find it too often happens with those who are merely plant collectors, that the pleasure which they at first experienced, when every species was new to them, and afforded a fresh subject for admiration, and every rare specimen brought with it a still greater delight in the acquisition, that they sooner or later became wearied of the pursuit. When they no longer find new or rare plants to rouse their attention, they give up the study altogether, or attempt to make no further progress in it. But this would never happen, if they would only chalk out for themselves some line of original research, upon which they might more especially fix their attention and make it their primary object to be continually searching for facts which bore upon it.

II.—*Observations on the Digestive Organs of Birds.* By William Macgillivray, A. M., F. R. S. E., M. W. S. Conservator of the Museum of the Royal College of Surgeons of Edinburgh.

The alimentary canal of birds not having been subjected to that kind of investigation which might lead to important zoological results, I have recently directed my attention to it, with the view of comparing its modifications of structure and form. It has seemed to me to be entitled to very special consideration, both on account

of its importance in the animal economy, and because of the advantage which might be derived from it in constructing an arrangement of the families, genera and species of a class of beings, which, however well defined in itself, has not yet been satisfactorily subdivided.

Various organs have, in some aspect or other, been brought forward as necessary to be considered in arranging birds; but to almost all systematic writers the bill and feet have supplied the characters by means of which the species have been disposed into groups. These organs, however, have by no means afforded unexceptionable marks of distinction; and even the more comprehensive sections of systems have, by employing them exclusively, been so vaguely defined, that the characters given do not in general apply to half the species which they are meant to include.

Thus, although many writers agree that there should be an order or great division, to which the names of Passeres or Insessores might be given, and composed of forms, such as the hornbill, the hummingbird, the thrush, the grossbeak and the kingsfisher, between which one, not at first sight only, but after long study, might fail to discover any great similarity, none has offered any general description of it less free of absurdity than the following by Mr Jenyns;—"Bill various; legs short, or of moderate length: feet adapted for perching: toes four, varying in position, flat underneath; hind toe articulated on the same plane with the fore toes: claws slender, somewhat retractile, curved and acute." Now, if with reference to so vast a number of species, nothing more precise can be said of the bill than that it is "various," either the bill is not capable of furnishing a character, or the group of Passeres or Insessores is most unnatural and heterogeneous. If the legs are "short or of moderate length," it might as well be said at once that they are not long. The feet are not better "adapted for perching" than those of the vulturine, falconine and strigine species; and many birds even among the Grallæ and Palmipedes perch as expertly, and on their perches stand as securely as most Passeres. The articulation of the hind toe is not peculiar to the Insessores, nor are their toes by any means so flat underneath as those of many other birds, the pigeons for example, the curlews, plovers, and geese. If the claws are generally "slender, curved, acute," so are they in the sparrow-hawk, the stormy petrel, and many other birds. Surely then, it is time to look for other characters than such as any one, unblinded by custom and creed, may at once perceive to be utterly inadequate. The removal of old errors is not less useful to science than the disclosures of new truths.

The nervous system of birds seems to me incapable of furnishing distinctive characters, because its parts are so similar in the different groups that, although they differ in each from any given standard, their differences cannot be intelligibly described. The same may be said of the vascular system, the respiratory, which, however, presents many tangible differences, and the generative, which has received little comparative examination. The organs of sense afford many good characters, especially the tongue, which, however, is more to be considered as an organ of prehension than of gustation; but they are too little diversified to form a basis of classification. The osseous and muscular systems, however, taken together, might afford a suitable basis; but their characters would be more applicable were they taken in connection with the digestive, to which they might be viewed as subservient. An alimentary canal is common to all classes of animals, and is in all more easily examined than any other apparatus, excepting the dermal; and as the nature of the digestive organs determines the more characteristic habits and actions of birds and other animals, they are obviously entitled to the highest consideration.

In Birds the digestive apparatus may, by superficial observers, be considered as very simple; yet it is certainly as complex as in the Mammalia; and as it presents modifications numerous and definable, easily observed and readily applied, it seems to me that, considered in all its parts, and taken as a centre of relations with respect to the other organs, it is better adapted for affording ordinal, family, and even generic characters, than any other.

Were I therefore to propose a new arrangement of birds, I should base it on the digestive organs, or the intestinal canal, under which are to be included the bill, the tongue, the mouth, the pharynx, the œsophagus, the crop, the proventriculus, the stomach, the duodenum, the small intestine, the cœca, the rectum, and the cloaca. The liver and pancreas, with the salivary glands, the mucous crypts, and the bursa Fabricii, might also be included. Some of these parts, as the bill and cloaca, are subservient to other purposes, but their primary function has relation to digestion.

I have been convinced by observation that correspondences in the part of this system of organs, are met by analogous correspondences in the habits and forms of birds; and whether it should really be found entitled to form the basis of an arrangement or not, its examination must tend to elucidate much that is obscure, and lead to important physiological results.

The digestive organs of birds, considered in the different species,

are capable of being arranged into groups, of which at least twenty, indicative of as many orders or families, might be enumerated.—Thus:

1. Œsophagus very wide, of nearly uniform diameter; stomach large, membranous, with separate muscular fasciculi; intestine short and slender; cœca rather long, narrow below, dilated towards the extremity; rectum with a large dilatation. Owls.

2. Œsophagus very wide, dilated on the neck; stomach large, membranous, its fasciculi not distinct; intestine slender; cœca extremely small, cylindrical. Eagles and Hawks.

3. Œsophagus wide, nearly uniform; stomach large, membranous, with large fasciculi; intestine short; cœca small. Kingsfishers.

4. Œsophagus extremely large, of uniform diameter; stomach very small, rather membranous than muscular, but with a cuticular lining; intestine short; two small cylindrical cœca. Gulls.

5. Œsophagus extremely long and wide, of uniform diameter; stomach small and membranous; intestine long and very narrow; no cœca, but in place of them a dilatation of the rectum projecting beyond the insertion of the small intestine. Herons.

6. Œsophagus long, narrow, of nearly uniform diameter; stomach a powerful gizzard, with two strong, two-tendoned muscles, a portion of one of which covering the fundus has its insertions below the central tendon: intestine long and wide; cœca long, nearly cylindrical. Swans, Geese, Ducks.

7. Œsophagus rather narrow; a large crop; stomach a powerful gizzard; intestine rather long and wide; cœca about half the length of the intestine, of great capacity, and having their mucous coat elevated into longitudinal ridges. Grous, Partridges, Pheasants.

8. Œsophagus rather narrow, but dilated into a large crop; stomach a powerful gizzard; intestine long, of moderate width; cœca extremely small. Pigeons.

In this manner, giving more detailed characters, and including structural differences (such as the longitudinal rugæ in the rectum of ducks, the villous plicæ in the cœca of grous, the smoothness, rugosity, or scission, of the cuticular lining of gizzards, the forms of the proventricular glandules, the modifications of the crop, which is muscular in eagles, perfectly membranous in some conirostres, glandular in grous, in the crossbill curved to the right so as to pass behind and almost encircle the neck, the arrangement of the horny papillæ of the mouth and fauces, the number of salivary glands, and the varieties presented by the tongue and bill,) I am persuaded from experience, that not only might birds be grouped according

to the agreement of their digestive apparatus, but that the groups thus produced would be perfectly natural, in respect at least to their principal habits.

It is not of much importance with what tribe of birds we begin; but as the rapacious species generally take the lead in systems, I shall not deprive them of their rank. And here, once for all, I must remark, that in every particular, the descriptions will be entirely original, that is, the result of my own observation.

I. *Digestive Organs of the Diurnal Rapacious Birds.*

As unexceptionable representatives of the aquiline and buteonine groups of this order of birds, we may take the Golden Eagle, *Aquila chrysaëtus*, and the Common Buzzard, *Buteo vulgaris*.

Plate IV. represents:—Fig. 1. the bill, 2. the palate, 3. the tongue, 4. the intestinal canal, 5. the rectum and cœca, of the Golden Eagle, one-third of the natural size; Fig. 6. a section of the proventriculus, 7. some of its glands, 8. the pylorus:—6 and 8. of the natural size, 7, enlarged.

The bill of the Golden Eagle, Plate IV. Fig. 1, is shorter than the head, very deep, compressed towards the end, with a longish decurved tip. The upper mandible has at the base a broad cere, *a*, or bare coloured skin; its dorsal outline, *b*, is slightly convex as far as the edge of the cere, then curved so as to form rather more than the fourth of a circle; the ridge, on the cere, is broad and convex, on the horny part narrow but convex; the sides at the base are nearly flat and sloping, towards the end erect and slightly convex; the edges towards the base, *c*, are soft, being covered with skin, continuous with the membrane of the mouth, beyond the nostrils sharp, direct, with a slight festoon; the tip decurved, subrigonal, acute. The lower jaw has the crura widely separated at the base, so that the angle at the base of the horny mandible is broad and rounded; its dorsal outline, *d*, is convex, the back broad, towards the end narrowed; the sides rounded; the edges at the base covered with skin, towards the end horny, inflected and sharp, and curving downwards to the tip, which, viewed vertically, is broadly rounded. The dorsal outline of the upper mandible is $2\frac{1}{2}$ inches long; that of the lower $1\frac{0}{12}$; the edge of the lower is $2\frac{1}{4}$; the height of the bill at the nostrils $1\frac{2}{12}$.

The mouth is wide, measuring $1\frac{7}{12}$ across. The palate, Fig. 2, is flat, at the sides smooth and sloping a little upwards, in the middle having a longitudinal depression, *a*, into which the tongue fits. This depression is bounded by two parallel ridges of skin, having on their summit minute papillæ directed backwards. In it behind the base

of the tongue is the narrow elliptical aperture of the nares, *b*, of which the slit, *c*, extends forwards nearly to its termination. At the commencement of the slit behind, is, on each side, a transverse papillate flap, *d*, and another behind the aperture, *e*; at its anterior extremity is a soft prominence, from which proceeds forwards a soft ridge, *f*. The tip or horny part is slightly, the lower mandible deeply, concave.

The tongue, Fig. 3, is $1\frac{5}{12}$ long, fleshy, rather narrow, concave above; its sides nearly parallel, the tip, *a*, rounded and distinctly emarginate, its free part beneath horny; the lower surface of the sides toward the base furnished with large mucous crypts; the base, *b*, concave in its outline, and fringed with pointed papillæ directed backwards. The space between the base of the tongue, *b*, and the aperture of the glottis, *c*, is covered with mucous crypts, of which there is also a lateral series on each side, *d*; and the posterior part of the pharynx is supplied with similar bodies irregularly disposed. The aperture of the glottis, *c*, is defended behind by a number of papillæ, *e*, directed backwards, and arranged in two lateral lobes, with a small intermediate one.

Fig. 4 represents the intestinal canal in its natural position, viewed from before; *a b* being the tongue, *c d* the trachea. The œsophagus, *c i*, measured from the base of the tongue to the stomach is 13 inches long. At its commencement it has a diameter of 2, gradually contracts to $1\frac{1}{2}$; about the middle of the neck, or 4 inches from the tongue, it dilates so as to form a kind of crop, *f*, capable of being distended to a diameter of more than 3 inches, and lying rather to the right side, the trachea, *c d*, passing along the left. On entering the thorax at *g*, the œsophagus again contracts to about 1 inch, and at its termination, *i*, enlarges to $1\frac{1}{2}$, forming the proventriculus, *h*, which is $1\frac{1}{2}$ long.

At its upper part, the œsophagus has a slight outer layer of inconspicuous muscular fibres. It is encircled by transverse fibres, forming a distinct coat. The inner or mucous coat is thrown into longitudinal rugæ when the organ is contracted; otherwise it is smooth and even. For a short space above the proventriculus, *h*, there is a circle of distinct longitudinal fibres. Over the proventriculus itself, the fibres are all transverse; and below it, at *i*, they are more conspicuous. Between the muscular and mucous coats of the proventriculus, are interposed numerous glandules, placed in apposition, nearly at right angles to the surfaces of these coats. Fig. 5 represents a longitudinal section of the walls of the proventriculus, of the natural size: *a* the outer or muscular coat, *b* the inner or mu-

cous coat, the glandules, longer in the middle and shorter towards the two extremities of the organ, being interposed between the coats. These glandules are of a cylindrical form, and have a central cavity with thick walls, and a spongy inner surface. A few of them are seen enlarged at Fig. 6. Their inner extremity is narrower, and they open on the mucous membrane, *b*, by an inconspicuous aperture, placed in the centre of a small rounded eminence. See plate VI. Fig. 5. The intervals between these eminences on the mucous surface, are minutely granulate, with tortuous grooves. The fluid which is secreted by these glands is of a greyish-white colour, and when cold of the consistence of slightly coagulated albumen. The walls of the proventriculus in the middle, narrowed towards the edges above and below, the glandules in its central part being $\frac{3}{12}$ long, with a diameter of rather less than $\frac{1}{12}$. Its internal cavity is not wider than that of the œsophagus immediately above it.

The stomach, *k*, which may be considered as commencing at the lower edge of the proventriculus, is of a roundish form, 3 inches long, $2\frac{1}{1}$ in its greatest breadth, somewhat compressed. Under its peritoneal covering is a large quantity of fat. Its muscular coat is thin, and is composed of fibres arranged in fasciculi, which are broader in the middle, or along the edges of the organ, and are inserted into two thin tendinous spaces; one on each side, about $\frac{7}{12}$ in diameter. At the upper or anterior part, these fibres diverging, leave an angular space on each side, at *i*. The inner coat of the stomach, to which the muscular fasciculi are adherent by the intervention of cellular membrane, is of a dense texture and reddish white colour. The inner surface is smooth, glossy, minutely granulate, the papillæ being arranged in tortuous lines.

The œsophagus at its upper part is placed directly on the middle of the neck, but gradually inclines to the right side, on which the crop lies unless when distended. At the lower part of the neck it inclines to the left side, passes into the thorax in the centre, when the trachea, *c d*, which passes along the left side, comes in front of the œsophagus and bifurcates immediately behind the base of the heart. The œsophagus continues inclining to the left side behind the left lobe of the liver, and joins the stomach opposite the last ribs. The stomach occupies the middle and left side of the abdomen, and when distended nearly fills the half of its cavity. It is somewhat nearer the sacrum than the anterior parietes.

The pylorus, which is represented by Fig. 7 of the natural size, is placed on the anterior curved edge of the stomach, as seen at *l*, Fig. 4, about half an inch from the edge of the cardiac orifice, and a

little inclined to the right side. It is closed by a kind of valvular apparatus, there being on the side next the œsophagus two prominent longitudinal rugæ, Fig. 7, *a*, *b*, and opposite them on the other side a small prominence, *c*.

The intestine, which is 50 inches long, first curves to the left, *l*, *m*, along or anterior to the edge of the stomach, until it nearly reaches the sacrum, and is then bent back in a parallel direction, curving forwards to pass under the right lobe of the liver at *n*. This fold, which may be named the duodenum, is connected by a reflection of the peritoneum, on which lies the pancreas, *o*. After receiving the two pancreatic and two biliary ducts, it becomes attached to the mesentery, makes a sweep backwards along the right side of the abdomen, is curved upwards and convoluted in the mesentery, then becomes attached to the lower edge of the stomach, forms a small fold similar to the duodenum, ascends along the back of the stomach, in coming off forms another fold, and then terminates in the rectum, which curves along the sacrum, supported by the narrow meso-rectum.

At its commencement, the duodenum is narrow, but suddenly enlarges to $\frac{7}{12}$, of which diameter it continues. Beyond the entrance of the biliary ducts, the small intestine gradually but irregularly diminishes to a diameter of $2\frac{1}{2}$-12ths, its narrowest part being at the end. There is no appearance of colon therefore ; a circumstance common to all birds examined by me.

In Fig. 4, *q*, *r*, indicate the extremity of the rectum, the rest being concealed. Fig. 8 represents that portion of the intestinal canal. At the termination of the small intestine, *a*, are two very small cœcal appendages, *b b*, which are cylindrical, rounded at the extremity, directed forwards, adherent, $\frac{5}{12}$ of a inch long, $\frac{1}{12}$ in diameter, with a very narrow mucous cavity. They come off on opposite sides, one generally a little below the other.

The rectum, *b*, *c*, is at once enlarged to $\frac{5}{12}$, continues to widen, and terminates in an elliptical or subglobular dilatation, *d*, beyond which is a short space separated from the rectum by a sort of ring or contraction, and which is named the cloaca, *e*.

Besides the peritoneal covering, the intestine has a muscular and an inner or mucous coat. The former is thickest in the duodenal portion, the inner surface of which is smooth, with scarcely any villosity, and even, without rugæ, being at first similar to that of the stomach. On the rest of the small intestine are long, extremely slender villi, which toward its lower part become more sparse. The inner surface of the cœca has a cellular appearance

that of the rectum is furnished at its anterior part with numerous mucous crypts. On the elevated ring or kind of valve which separates the rectum from the cloaca, open the two ureters, *g*, *g*; and behind it is the entrance to the bursa Fabricii, a large oval bag lyover or behind the end of the rectum, and of which the inner surface is coarsely rugous, with rounded prominences, and numerous irregular cellular cavities, secreting a mucous fluid. The inner surface of the cloaca is smooth, and it is closed by a strong sphincter.

The above description is taken from a male bird shot in Lochaber in the winter of 1835. In a female, which had been kept in a state of captivity for several years, the dimensions of the intestinal canal were as follows:

Œsophagus 12¾ long, dilated on the neck into a crop 5½ long, and 3 in diameter, then contracted to 1¼; the proventriculus 1½ in diameter. The stomach, 2¼ long, its tendons $\frac{9}{12}$ in diameter. The intestine 66 inches long; at the commencement it has a diameter of $\frac{3}{12}$, but immediately enlarges to $\frac{10}{12}$, and so continues for 12 inches, when it gradually contracts, so as near the cœca to be only $\frac{3}{12}$ across. The cœca are $\frac{4}{12}$ long. The rectum is 7 inches in length, its dilated part 2 in diameter.

The crop and the stomach may present different appearances in individuals, according as they are more or less full or empty when the bird is killed. When empty and contracted, they can scarcely be inflated to so large a size as that which they present when they have been stuffed with food by the bird. In the latter case, they retain, when emptied after death, the form given to them. Persons therefore, measuring their dimensions in these different conditions, would differ greatly in their statements. The measurements given above and in the sequel, are taken from the parts inflated with air.

I shall now offer a few remarks on the digestive process. By means of the sharp-edged, strong mandibles, and the pointed decurved tip of the upper, the eagle tears up fragments of flesh from the quadrupeds or birds which it has captured with the aid of its powerful wings and feet, and killed by thrusting into them its long, curved, tapering, very acute claws, or from animals which it may have found dead. If the supply be plentiful, it fills the stomach, and afterwards the crop; for I have found them both completely crammed, both in this species and in other birds of the family. It is not nice in selecting its morsels, but swallows along with them bones, hair, and feathers, in considerable quantity, when the prey is small. The crop or dilatation of the œsophagus is merely a recipient of the food, which is found in it quite unaltered, and it is en-

tirely destitute of mucous crypts. When the crop, stomach, and intermediate space are found filled, the solvent action is first perceived in the proventricular space; but it is doubtful if the secretion from its glandules effects the solution; for, on examining the parts, we find the fluid of the glands uniformly diffused over its surface, and covering the interior of the stomach, sometimes in its whole extent, but generally in its upper part. In this state, the proventricular fluid, coagulated as it were, might, on a superficial examination, be considered as the inner coat of the stomach dissolved by the gastric juice. When the soluble part of the contents of the stomach has been reduced to a pulpy state, it passes through the pylorus, which rejects the hair and feathers. These, with undissolved bones, cuticular linings of gizzards, seeds and other vegetable substances, are, by the contraction of the muscular fibres, thrust into the œsophagus, and vomited in dense pellets. In the duodenum, the pulpy mass is farther diluted, has a light-red colour, and seems to undergo a farther digestion. On being mixed with the bile it assumes a light-greenish tint, and deposits the chyle on the surface of the intestine, whence it is absorbed. Towards the lower part of the small intestine, it becomes darker and thickens, and the refuse enters the rectum in a cylindrical rather concrete form. There it is diluted with mucus and urine, and is finally ejected at once in a semifluid state, of a dark-green colour, mixed with flakes of white.

The intestinal canal of the Common Buzzard, *Buteo vulgaris*, is so remarkably similar to that of the golden eagle, that the same description might answer for both, unless with respect to the actual dimensions.

The bill is proportionally much smaller, less deep, and having the outline of the upper mandible more sloped; but in other respects it bears a great resemblance to that of the eagle. The mouth is wide, measuring $1\frac{5}{12}$ across; the palate, flat anteriorly, having a broad soft ridge, from the posterior part of which proceed backwards two very prominent, nearly parallel soft ridges, bearing small pointed papillæ. Between them is the depression which corresponds to the tongue. A transverse papillate edge proceeds inwards from the middle of these ridges, and they terminate in a similar curved edge behind. The posterior aperture of the nares is narrow-elliptical behind, linear before, with papillate margins. The tongue and other parts of the mouth are as in the Golden Eagle.

In Plate V. is represented the intestinal canal of a male individual of this species. Fig. 1 exhibits a lateral view of the organs in their natural position, diminished to half their size, the parts

marked with the same letters as Fig. 4 of Plate IV. There are here seen in addition, the bursa of Fabricius, *s*; a section of the lung, *t*, the position of the heart, *u*, that of the liver, *h n*, and of the sternum, *v*.

The œsophagus, *e f g h*, is 6 inches long, dilated anterior to the thorax into a large sac, *f*, $1\frac{3}{4}$ in diameter, and 2 long. Its muscular coat is strong, its inner smooth. At its entrance into the thorax at *g*, it contracts to $\frac{10}{12}$, and again enlarges to $1\frac{1}{4}$ in the proventricular part, *h*. For an inch above the latter, the fibres are longitudinal. The proventricular glands are close, cylindrical, with a narrow villous cavity, opening by a small orifice scarcely perceptible in the middle of a small rounded eminence on the inner surface, which presents the same appearance as in the eagle.

Fig. 2 is a longitudinal section of the walls of the proventriculus. Fig. 3 shows one of the glands enlarged; *a*, the gland, *b*, the mucous surface of the proventriculus, *c*, its muscular coat. Fig. 4 represents, at *a* three rows of the glands, at *b* the inner coat of the proventriculus, at *c* the fibres of the muscular coat reflected. Fig. 5 represents, much enlarged, the appearance of the inner surface of the proventriculus.

The stomach, Fig. 1. *k*, is $2\frac{1}{2}$ long, $2\frac{1}{4}$ broad, somewhat compressed. Its fibres are disposed in fasciculi, and the tendinous centres are $\frac{5}{12}$ in diameter. The inner surface is smooth, glistening, and minutely papillar. The pylorus, Fig. 6, has on the side next the cardia three prominent rugæ or valves, *a*, and opposite them on the other side two small prominences. The intestine is 54 inches long. The first fold, *l*, *m*, *n*, occupies the same position as in the eagle, and the other parts may be described in the same manner. The cœca, Fig. 7, *c*, *c*, are $\frac{3}{12}$ long, cylindrical, the rectum, *a*, $4\frac{1}{2}$ long, much dilated.

The inner surface of the upper part of the duodenum is like that of the stomach. On its lower part and on the small intestine are very long extremely delicate villi, which gradually become fewer. The other parts are as in the eagle.

In another male, the œsophagus was $7\frac{1}{2}$ inches long, the stomach 3; the intestine 51; the cœca $\frac{5}{12}$; the rectum $4\frac{1}{2}$.

In a female, the œsophagus was 8 inches long, its sac 3 long and 2 in diameter, the proventricular part $1\frac{1}{2}$; the stomach 2 in diameter, $1\frac{1}{2}$ in thickness, its tendons $\frac{8}{12}$; the intestine 56, its diameter below the pylorus only $\frac{2}{12}$, but presently $\frac{8}{12}$, its smallest diameter $2\frac{1}{4}$-12ths; the cœca $\frac{2}{12}$ long; the rectum at first $\frac{6}{12}$ in diameter, half way down $\frac{8}{12}$, in its dilated part 2 inches.

The appearances presented by the alimentary mass in its progress are the same as in the Golden Eagle. The mouth, œsophagus, and stomach, are plentifully lined with mucus. The food undergoes no change in the crop, but begins to be dissolved in the proventriculus. Digestion is accomplished in the stomach and duodenum; the chyle is absorbed in the small intestine, and the refuse passes into the rectum, whence, diluted with the urine, it is ejected in a mass, and thrown to a distance.

III.—*Botanical Notes.* By Charles C. Babington, M. A. F. L. S. &c.

Callitriche pedunculata.—A common form of this plant having been often mistaken for C. autumnalis, I give the following short account of such of its varieties as have been noticed by me. In a specimen sheet of the second (inedited) edition of *Bluff and Fingerhuth's Compendium Floræ Germanicæ*, which has accidentally fallen into my hands, a very detailed account is given of the German species and varieties of this most variable genus. It is extracted from Kützing's monograph in Reich. pl. crit. ix. p. 31–42, *f.* 1179–1220. I suspect that our plant is not included, but from not having access to those plates, I cannot be quite certain, and have therefore named my varieties.

C. pedunculata.—"Fructiferous peduncles more or less elongated, without bracteæ at their base; fruit regularly tetragonal, each portion obtusely carinate at the back."—Arnott.

α. vera. Fruit stalked.

a. lineata. Leaves linear.

b. spathulata. Leaves ovate or oblong-spathulate.

c. verna, cæspitosa, DC.?

β. sessilis. Fruit not stalked, leaves all linear, or a few of the upper ones subspathulate elongated.

This plant under all its forms may be at once known by the apparently constant absence of bracteæ, which, together with its very slender, elegant, and pellucid appearance, (except in subvar. spathulata,) distinguishes it from *C. verna*. Its obtusely keeled fruit, about equal in size to that of C. verna, also points out its difference from *C. autumnalis*, which has fruit of full twice that size, and strikingly contrasted with the dark-green foliage by its much paler colour.

The varieties appear to be caused by its place of growth. The fruit is always, as far as my observations go, sessile when the plant inhabits deep water, such as that of the Welsh lakes and rivers, and the leaves become slightly spathulate if its top reaches the surface. The varieties with stalked fruit grow in shallow water (*a*,) or on wet mud not often flooded (*b*.) Var. *a* is a peculiarly slender and delicate plant, and very small in all its parts; in *b* the internodes are much shortened, the leaves small, ovate, or shortly spathulate, and the stem rooting at many of the joints. The linear leaves are usually emarginate, and those which reach the surface of the water have generally three nerves.

Var. *β*. is the most common form. I have noticed it in St Leonard's Forest, Sussex, in lakes and rivers near Snowdon and in Anglesea; *a*. occurs at Caernarvon, and near the Mona Inn, Anglesea; *b*. I have only seen near Bethws Garmon, Caernarvonshire.

Hieracium, n. s.?—Scyons very short and densely leafy. Leaves sessile, oblong-lanceolate, acute or rounded, entire, beset with numerous long silky hairs on both surfaces, each hair thicker towards its base, and springing from a small dark-coloured bulb, which is more apparent on the upper surface, on account of the absence of the dense white wool with which the under surface is quite covered. Scape 1-flowered, leafless, covered with numerous long white silky hairs with a black base, and intermixed with them a good many small black short ones, each bearing a gland at its top. Flower large, pale-yellow; involucrum very like that of H. alpinum, its bracteæ in two rows, with a few lax smaller ones at the base, each bractea broadly linear, lanceolate, acute, covered with dense white wool, and bearing very numerous long silky hairs with a black base, these latter not extending to the margins.

This plant differs very much in habit from H. pilosella, and may be distinguished, at first sight, by its very short and leafy scyons, much longer leaves, larger flowers, and copious silky pubescence.

In the three latter characters it almost exactly resembles H. alpinum. It also closely approaches H. pilosellæforme, Fl. Helv. v. 72, but differs in the shape and peculiar pubescence of its involucral bracteæ.

The only British station for this plant, with which I am acquainted, is Craig Breidden, Montgomeryshire, where it grows upon the crags of a lofty precipice. This station is referred by Dr Hooker, from an inspection of my specimens, to H. alpinum in his Brit. Fl. ed. 3, p. 348.

Taraxacum dens-leonis, Desf.—As it is probable that all the Eu-

ropean plants, referred to this genus, form only one very variable species, I do not attempt to form a specific character.

Leontodon taraxacum, Linn. Sp. Pl. 1122.

a. officinale. Leaves runcinate, with the terminal lobe largest, outer involucral bracteæ lanceolate, reflexed.

a. verum. Leaves broad runcinate.

L. taraxacum, Auct., Eng. Bot. t.

L. officinale, Withering. iii. 679.

L. tar. I. Gaudin, Fl. Helv. v. 61.

L. tar. *α.* oleraceum, Bluff et Fingerh. ii. 266.

Taraxacum dens-leonis DC. Bot. Gall. i. 300.

b. angustifolium. Leaves slender, runcinato-pinnatifid.

Dens-leonis angustioribus foliis, Ray, Syn. 171.

L. tar. *β.* Sm. Eng. Fl. iii. 349.

L. tar. *β.* arenarium, Bluff et Fing. l. c.

Narrow Dandelion, Petiver, H. B. t. 11. f. 8.

Leaves oblong, runcinate, the segments pointing downwards, more or less triangular, acute, denticulated above the incisions, seldom or never reaching the midrib, (except perhaps in var. *b* in which the leaves are narrow and deeply pinnatifid ;) the terminal lobe large, round at the end, and usually the broadest part of the leaf, midrib very broad and longitudinally striated, the striæ usually 5. Scape smooth, tall, thick, seldom much longer than the leaves. Involucral bracteæ long, lanceolate, the outer ones not much shorter than the inner row, (except a few at the base,) reflexed. Fruit dull yellow, oblong-oval, compressed, striated, with two strong ribs on each side, two weaker ones in the centre, and two between each of them and the dilated margin, its upper half roughish, with numerous rigid papillæ, becoming longer, and taking nearly the form of spines at the dilated apex of the fruit, which is suddenly attenuated into a very long slender rostrum. Pappus rough with minute alternate teeth.

Of this variety I need say nothing, as it grows in every field and waste place. The synonym of Ray is referred to my subvariety *b.* from the observation of Sir J. E. Smith, that " its calyx scales retain their due proportion and position," and from the figure of Petiver ; although the description given by Ray would apply equally well to the var. lævigatum. He says it differs from the type of this variety, " foliis paucioribus et angustioribus, profundius laciniatis, semine etiam rufo, cum illius citrinum sit."—I have not seen this plant.

β. *lævigatum.* Leaves pinnatifid with two intermediate teeth, outer involucral bracteæ ovate-lanceolate, patent, not reflexed.
T. lævigatum, DC. Bot. Gall. i. 300.
L. tar. II. lævigatum, Gaud. l. c.
L. alpestre et arcuatum, Bluff et Fing. l. c. ?

Leaves slender, pinnatifid, with two small tooth-like processes (on both sides of the midrib,) in each interval between the long narrow acute segments which point downwards; the terminal lobe smaller than the others, acute, often forming merely a point to the leaf; in some cases the segments are all enlarged, and the leaves approach the runcinate form of var. officinale, the tooth-like processes being seated more or less upon the upper edge of the segments; (in one of my specimens a single leaf is so much widened as exactly to resemble those of var. officinale;) midrib narrow, with three longitudinal striæ. A specimen from Sussex has the leaves much longer, with greater intervals between the segments, and the tooth-like processes filiform and very minute. Scape smooth, slender, usually erect, longer than the leaves, sometimes twice their length. Involucral bracteæ with slender white margins; the inner ones rather broadly lanceolate, obtuse, the outer very short, ovate-lanceolate, erect, patent, not recurved. Florets often tubular for three-fourths of their length. Fruit red, clavate, striated, the ribs less strongly marked than in var. officinale, its upper part very broad, armed with strong spines for about one-fourth of its length, and gradually attenuated into the beak, the base of which is red like the fruit, for a short distance. Pappus rough, with minute alternate teeth, not smooth (lævis) as described by Gaudin.

This form of our variable plant occurs on banks, walls, chalk-hills, and other dry places, also on the sands near the sea. I have received it from Sussex, through the kindness of Mr Borrer, and have gathered it at Cleyhorf, on the Gogmagog hills, Cambridge; and in Anglesea on the sands near Llyn Coron and Malltraeth. The Cambridge specimens are far less elegant than the others, approaching most nearly in appearance to var. officinale. This plant is usually so slender in all its parts as to attract attention from its beauty, and is probably far from rare, but has been passed over as an accidental variety.

I have seen small specimens, which I cannot refer to either of the other varieties, having the leaves obovate, strongly dentate, but hardly runcinate, and narrowing into a long petiole, the inner involucral bracteæ lanceolate, obtuse, the outer row broadly ovate-lanceolate, short. I at one time supposed that this might be T. obovatum,

DC. and Willd. Hort. Berol. t. 47; but on examining that excellent plate, it appears that the plant there given differed materially from any plant which I have noticed in Britain. It has the inner involucral bracteæ acute linear, the outer lax and lanceolate; scape with its upper half beset with spreading hairs; the fruit with four longitudinal furrows, and several transverse lines at its base, giving that part a granulated appearance; the upper quarter of its length is covered with very strong spinose teeth, and it is suddenly contracted into the beak. I cannot help thinking that this also is a var. of T. dens-leonis.

γ. *palustre*. Leaves narrow, nearly entire, outer involucral, bracteæ ovate, adpressed.

L. palustre, Smith, Engl. Bot. t. 553.

L. taraxacon, With. l. c.

T. palustre, DC. l. c.

L. taraxacum, III. palustre, Gaud. l. c.

Leaves long, narrow, nearly entire, or moderately toothed, not runcinate, the teeth pointing downwards; midrib reddish, very wide in proportion to the leaf, striated, but in a less marked manner than in either of the other varieties. Scape smooth, rather thick, oblique, often bent, slightly woolly beneath the involucrum, but little longer than the leaves. Involucrum with the internal row of bracteæ lanceolate, edged with white, rather blunt, the external ones broadly ovate, acute, short, imbricated, erect, always adpressed, never recurved, except when the seed is quite ripe.

A very different plant in appearance from either of the other varieties; but there are so many intermediate forms that it must be deprived of its rank as a species.

It is not uncommon in wet marshy places, such as the fens of Cambridgeshire.

Briza, n. s. ?—Spikes ovate, about seven-flowered; glumes shorter than the paleæ; ligule lanceolate, very long, fixed by its back to the leaf.

This plant differs from B. media in the structure of its ligule, which is exactly that of B. minor, *i. e.* very long, lanceolate, fixed by its back to the leaf, and having its apex free. It differs from B. minor in having a creeping root, and the habit and flowers of B. media. It is often more than a foot high, and flowers in August.

Near Bath: gathered in 1833. This is the plant given in my Fl. Bath as B. minor. If a new species, perhaps *autumnalis* might be considered an appropriate name, as its allies are earlier flowering plants.

Alopecurus fulvus.—A careful examination of this plant and A. geniculatus, has shown me the following distinctions between them:

A. fulvus.—Flowers one-third less than those of A. geniculatus; palea as long or longer than the glumes; awn inserted just below the middle of the palea, and slightly longer than it; anther short and broad. Sheaths of the leaves white between the ribs, with very minute hoary granules. Panicle very long.

A. geniculatus.—Palea shorter than the glume; awn inserted near to the base of the palea, and twice its length; anther linear. Sheaths of the leaves without hoary granules. Panicle shorter.

Festuca duriuscula, γ. hirsuta. F. hirsuta, Host. ?—Root black, fibrous. Radical leaves setaceous, glaucous, half as high as the stem; stem leaves involute; sheaths three or four times as long as the leaves. Stem obsoletely quadrangular, covered with very minute down. Spikelets four or five-flowered. Glumes hairy; external palea very densely pubescent, internal glabrous, with its margin ciliated; anthers two or three times as long as their filaments.

I have drawn up the above description of this plant on account of its not having been noticed in any work on the plants of this country. Gathered on the summit of Pen y Gader, the highest summit of Cader Idris, Wales, July 1832.

Polypodium calcareum—may always be distinguished from P. dryopteris by being minutely mealy in all its parts. Each particle of this mealiness, under a high magnifying power, appears to be a minute stalked gland. I have not been able to find any trace of this on P. dryopteris.

IV.—*The Characters of two new Genera of South African Reptiles, with descriptions of species belonging to each.* By Andrew Smith, M. D., M. W. S., &c.

In the year 1825, I first obtained the Cape species of the genus *Chrysopelea*, and on examining it, I observed some peculiarities of formation which were not exhibited by any of the genera of serpents with which I was acquainted. From that circumstance, I was immediately led to set it apart as a type for an additional division, and, from the singular manner in which the abdominal plates were formed or apparently divided, I constructed the term Aspedotrischedis to designate the new genus.

Soon after that I had a visit from my late friend, the lamented M. Boie, on his way to Java, when I substituted the name *Chry-*

sopelea, in consequence of having learnt from him that he had, previous to his departure from Europe, observed like appearances in the Coluber ornatus, and had on that account separated it from the other then constituted genera, under the title of Chrysopelea ornata. Though the term employed by me was originally framed as the designation of a genus for the Cape species, without any knowledge of what had been accomplished in Holland, yet that of M. Boie had priority as its patron, and to whatever enjoys that, an immediate and unqualified preference ought invariably to be given. Whoever had the pleasure of witnessing the noble candour and liberality of that celebrated and highly talented naturalist while he was alive, could scarcely feel disposed to act otherwise towards his memory, and it must always be a source of regret with the lovers of natural history, that an individual so eminently calculated to advance their favourite science should have almost immediately fallen a victim to the deleterious effects of the climate of the country he was appointed by his government to explore.

The three species of the other form, for which I have established the genus *Pleurotuchus*, present certain of the characters of the *Scinci*, but at the same time have several others peculiar to themselves, amongst which one of the most particular is an elevated longitudinal fold of skin, which extends from the angle of the mouth to the base of each hinder extremity, the one edge of which is loose and directed upwards, so as to conceal when undisturbed a narrow stripe of minute granular or warty-looking bodies, which, instead of scales, cover the skin immediately above its base or fixed edge.

Class Reptilia. Ordo Sauri. Familia Scincidæ. Genus Pleurotuchus.

Ch. Gen.—*Caput* quadrangulare, supra scutatum.

Dentes in maxillis et palato, priorium æquales, fixi approximatè, sublongi, cylindrici, acuminatè et confertum applicati ad superficiem internam ramorum, ultimi breves acuminati cylindrici et in seriebus duabus profunde in ore siti.

Lingua crassa depressa et apice incisa.

Oculi palpebris duabus, pupillis circularibus.

Corpus subquadrangulare, dorso lateribusque squamis quadrangularibus carinatis tectis ; abdomine scutis quadratis in fasciis transversis, gutture hexagonis. *Plica* longitudinalis cutis prominens inter angulum oris et extremitates posteriores.

Cauda subcylindrica, verticillata, et squamæ, exceptione illarum prope anum, valde carinatæ.

Pedes quatuor, dactyli quinque; digiti palmarum breves, 2dus et 3ius fere æquales, posteriorum longi, 2dus longissimus.

Pori femorales.

1. Pleurotuchus typicus.—*Supra brunneus, dorso duobus lineis longitudinalibus albis et duobus nigro variegatis; lateribus maculis subflavis notatis; subtus flavo-albus.*

Back and sides brownish, the former with two longitudinal lines on each side, the outermost white and narrow, the innermost black and rather broader. Both commence at the outer corners of the eyes, run in contact with each other, and the white one terminates near the commencement of the tail, while the other extends nearly half way to its point, and there, after uniting with its fellow of the opposite side, gradually disappears. Sides variegated by small, somewhat square, spots of a yellowish cast, and the ground colour is clouded and mottled with darker tints, which in some places approach to black. Belly yellowish white; tail tinted with brownish, brownish-red, and yellowish-white, but disposed in no regular order. Legs and toes the same colour as the body, without variegations. Femoral pores sixteen in number; ten longitudinal rows of plates on belly. Length from nose to anus four inches, from anus to tip of tail seven inches and a-half. This lizard inhabits the dry sandy flats of Little Namaqualand, and is rather abundant towards the mouth of the Orange river, where it is called by the native Hottentots *Ourukaima-aap*. Its motions are very quick, and when discovered upon open ground runs towards the roots of the first bush it can find, and from thence if pursued into any hole it can perceive, but if one cannot be discovered, it even attempts, and frequently succeeds, in forcing itself under loose sand, so as to escape detection.

2. Pleurotuchus Desjardinii.—*Supra sub-brunneus, dorso fasciis duobus longitudinalibus, exteriore albo, interiore nigro, maculis nigris maculatis; lateribus lineis verticalibus nigris et albis notatis; subtus flavo-albus.*

Colour of back and sides brownish, with two longitudinal lines or stripes on each side of the former, the outermost white, and the innermost black; those of each side in direct contact, commence behind the eye and terminate on the root of the tail; along the centre of the back an irregular row of black spots, each marked with one or more dots of white. Sides variegated by narrow vertical stripes alternately black and white, below yellowish white; legs greenish brown, variegated with a few white spots; femoral pores about twelve in number; eight longitudinal rows of plates on belly. Length from nose to anus three inches and a-half, from anus to tip

of tail five and a quarter. Inhabits the country alongst the south-east coast, and is usually found in damp retired situations, either in wooded spots or in their neighbourhood. Named in honour of M. Desjardins, Secretary of the Natural History Society of the Isle of France.

3. Pleurotuchus chrysobronchus.—*Supra brunneus, dorso duabus lineis flavis et duabus nigris notatis ; lateribus brunneis, griseo umbratis ; gutture flavo ; abdomine livido-albo.*

Colour above brown, with four longitudinal stripes on the back, the two outermost yellow, the two innermost black ; upper part of sides brown ; lower brown, shaded with gray ; anterior part of throat a fine bright light yellow ; belly bluish white ; legs and toes brown ; length of body four inches ; length of tail six and a-half. Inhabits damp woody situations towards the sources of the Cowie river, about Graham's Town and Blue Kranz.

Ordo Ophidii. Familia Colubridæ. Genus Chrysopelea. *Boie.*

Char. Dentes per series 6 dispositi ; *maxillares* mediocres, fere æquales ; cylindrici, acuti et angulo obtuso recurvi ; *palatinorum* parvi, breves, numerosi, approximati ; *mandibularum* mediocres, anteriores remoti, longiores, posteriores approximati, omnes leviter recurvi.

Caput distinctum, depressum ovato-triangulare, apice rotundato rictu oris amplo ; nares mediocres subverticales ; oculi magni verticales, pupilla rotunda.

Truncus longus subcylindricus.

Cauda tenuis longa et triangularis.

Scuta abdominis versus extremitatem carina transversa obtusa.

Squamæ caudæ transversè carinatæ.

1. Chrysopelea Boiei. Ch. *Supra virido-brunneus, anteriore parte dorsi linea flava longitudinale variata ; labio superiore, margine externa superciliorumque flavis ; linea nigra longitudinale inter oculum et occiput ; infra virido-flavus.*

Abdominal plates 165. Subcaudal scales 119 pairs.

Colour above greenish brown, variegated by a partial yellow line, which commences at the hind head, and extends along the centre of the back for six or eight inches. Outer edges of eyebrows clouded with yellow ; upper lip pure yellow ; the lowermost row of scales on each side buff yellow, and from each eye to the hind head a narrow black stripe ; belly greenish yellow. The scales are disposed nearly in transverse rows, those of the dorsal row large and somewhat six-sided, those of the others oblong, linear, and one edge behind slightly elongated and pointed. Length of body two feet seven inches,

of tail fourteen inches and a-half. Inhabits the Island of Ceylon, and does not appear to have been yet described.

It is named in honour of the individual who formed the genus, and though the form and mode of arrangement of the scales are different to those of Chrysopelea ornata, yet it is clearly a species of the same genus. As far as regards the character of the scales and their mode of distribution it is nearly allied to the genus Bucephalus, as described by me in one of the numbers of the Zoological Journal.

2. Chrysopelea Capensis—Ch. *supra viridi-cærulea, infra antice viridis, viridi-flavo umbrata, postice viridi-cærulea.*

Abdominal plates 216. Subcaudal scales 109.

Above greenish blue, verging towards a light slate hue; head tinted with purple; anterior part of belly light green, mottled with greenish yellow, posterior part the same colour as back; scales large, subovate, and disposed in oblique rows, as in the Chrysopelea ornata, all of them, as well as the abdominal plates and subcaudal scales, with a shining metallic lustre; eyes brown. Length from nose to anus two feet eight inches, from anus to tip of tail eleven inches. The three species probably all belong to that class of snakes which generally resort to trees to obtain their food,—at least the last described was killed when turned round the branch of a high shrub, near to the mouth of the Orange river.

As has already been remarked, the scales of the present species are arranged as in the one which Mr Boie selected for the type of the genus. Their forms also approximate to those observed in it, and thus differ in both respects from the Chrysopelea Boiei, found in Ceylon.

V.—*Characters and Descriptions of the Dipterous Insects indigenous to Britain.* By James Duncan, M. W. S., &c. &c.

(In the following series of papers it is proposed to give a list of the Dipterous insects indigenous to Britain, with the Generic characters, Specific descriptions, and Localities, with as much accuracy as it is possible from the materials in the possession of the author. This singular and interesting tribe of insects has been hitherto comparatively neglected by British entomologists, but several valuable continental publications have been devoted to them, and in drawing up the characters and descriptions, Mr Duncan has chiefly made use of *Meigen's Europaischen Zweiflugeligen Insecten*, and *Macquart's Insectes Diptères du nord de la France*, works of great precision and minute accuracy.—We have already to offer our acknowledgments to several gentlemen, for communications relative to the

English and Irish Diptera, and again earnestly request additional information respecting Species and Localities, which will either be introduced in the proper places, or added as supplements to the parts which may be previously published.—The species which have been found in Scotland are distinguished by a small s. after the specific name.—The next paper will include the *Tabanidæ*.—Eds.)

ORDER DIPTERA,

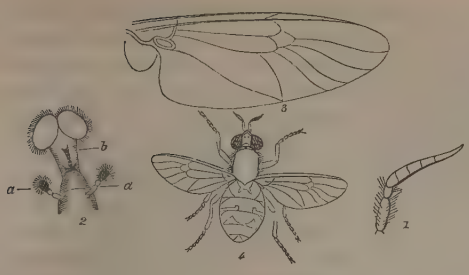
Family STRATIOMYDÆ, *Latr.*

The family group of two-winged flies, distinguished by the above name, have the antennæ porrect, approximating at the base, and composed of three joints, the third, or terminal joint, divided into rings by means of faintly marked incisures. These organs are generally furnished with a style or an elongate seta at the extremity. The proboscis is short, the labella alone being exserted. The ocelli are three in number, and placed in the form of a triangle usually on the crown: abdomen oval, generally wider than the head, and flat or slightly convex, composed of five segments; wings when at rest overlapping each other, and lying along the back of the abdomen, leaving the sides of it exposed, and projecting beyond the apex. The typical genera are rather of obscure colours, having the sides of the body ornamented with light-coloured spots and abbreviated bands. The species frequent marshy places, and the larvæ, in most instances, are aquatic. The indigenous genera admit of being distinguished by the following concise external characters:

Scutellum armed; antennæ,	without a terminal style, or having only a very short one;	1st joint much longer than the 2d	Stratiomys.
		1st and 2d joints nearly equal	Odontomyia.
	with an elongate style;	3d joint 4-ringed	Oxycera.
		——— 5-ringed	Clitellaria.
Scutellum unarmed; 3d joint of the antennæ	orbicular;	abdomen somewhat globular	Pachygaster.
		———oblong	Sargus.
	ovate		Chloromyia.
	subfusiform		Nemotelus.

Genus STRATIOMYS, *Geoffroy.*

Antennæ rather longer than the head, directed forwards, approximating at the base, the third joint diverging obliquely; the first joint elongate and cylindrical, the second short and cup-shaped, the third very long, subfusiform, divided into five distinct rings, and without a terminal seta, (Fig. 1:) proboscis short; the labrum linear, corneous, notched in front; (Fig. 2 *b*;) palpi three-jointed,



the two lower joints subcylindric, the third somewhat thickened, obovate and pilose; (Fig. 2, *a*.) thorax oval, pubescent; scutellum semicircular, armed posteriorly with two spines; abdomen oval, flat or very slightly convex; winglets and halteres rather small; neuration of the wings as in the accompanying figure (3.)

Larva aquatic, breathing by means of a star-like radiated apparatus attached to the tail.

Stratiomys is placed at the head of this family, as exemplifying in the most characteristic manner the peculiarities by which it is distinguished. As above defined, this genus comprehends six British species, nearly all that have been ascertained to inhabit Europe. They are all of pretty large size, and very similar to each other in colour, and the distribution of their markings. The larvæ, which are admirably delineated and described by Swammerdam, under the name of Asilus,* are of singular and elegant structure, especially in their respiratory organs. In the shape of the body they are somewhat fusiform, thickest before the middle and tapering to both ends, the caudal segment much more elongated than the others, and supporting at the extremity a circle of about thirty diverging rays. These rays are beautifully feathered, capable of repelling water, and placed round an orifice in the tail, communicating with two very large tracheæ or air-vessels. When the insect desires a supply of fresh air, the tail is raised to the surface, and these rays expanded on all sides; a free communication is thus opened by a kind of obconical funnel, between the atmosphere and the aperture in the tail, even though the latter be a little beneath the level of the surface. When about to descend, the points of the hairs are drawn towards each other, and a globule of air enclosed, which shines in its passage through the water like a drop of quicksilver. The use of this air-bubble seems to be both to afford a continued supply of air, and to render the body more buoyant when it becomes necessary to reascend. To facilitate the same object when the air happens to be exhausted while beneath the surface, the animal seems to possess

* Book of Nature, (Hill's edition,) p. 43–62; pls. 39–42.

the power of again replenishing its little reservoir by forcing air into it from the tracheæ. Its motions in the water are very slow, and it advances by bending its body in different directions. Swammerdam supposed that it fed on clay and soft earth, substances which he sometimes found on dissection lodged in the stomach; but it is much more probable that its food consists of the minute infusoria which abound in the stagnant waters which it usually frequents. * It is furnished with short ciliated organs on each side of the head, which are frequently kept in a state of rapid vibration, by which slight currents are produced in the direction of the mouth,—a circumstance which would tend, on the supposition just made, to bring its food completely within its reach. When about to change into nymphs, the skin of these larvæ becomes stiff and rigid, and in that state forms an envelope for the pupa, which is contracted into an oblong figure, and occupies but a small space towards the widest end of its capacious tube. The fly is soon matured, sometimes in six or seven days, and makes its escape by forming a rent in the second segment.

It is unnecessary to advert at any length to the opinion entertained by Professor Knoch, and countenanced by Meigen, respecting the larvæ of the Stratiomydes, namely, that they are of a parasitical nature, and live in the interior of the aquatic worms above described, which according to them have long been erroneously regarded as true dipterous larvæ. The observations on which this view professes to be founded are quite inconclusive, and it is in itself so highly improbable, that it is surprising how it could be advanced in opposition to the well authenticated statements of the older naturalists.

1. Stratiomys chamæleon. (s.)

Musca chamæleon, *Linn.*; *Donovan*, i. pl. 31, fig. 1st, pl. 35, *larva*. Latreille, *Gen. Crust.* iv. 274. Panzer, *Fauna Germ.* viii. 24; Geoffroy, *Ins.* ii. pl. 17. fig. 4; De Geer, *Ins.* vi. 151, 1.—Swammerdam, *Book of Nat.* pl. 39 to 42.—Stratiomys chamæleon, *Meigen*, iii. 124; *Stephens, &c.*

Head and antennæ black, the former with the hypostome† black in

* Swammerdam affirms that these insects are found in *salt* water as well as fresh; but as this statement has not been confirmed by subsequent observation, and is contrary to what takes place in almost every other instance, it is probable that it was either made inadvertently, or that the larvæ noticed in such situations by that illustrious physiologist had been transported thither accidentally, which might easily happen by means of running water. Once conveyed thither they might survive for a length of time, for they can live upwards of twenty-four hours in spirits of wine and vinegar. So tenacious, indeed, are they of life, that after immersing them in several fluids without effect, Swammerdam's patience became exhausted, and he proceeded to dissect them alive.

† This term, which it is convenient to retain, is employed by Meigen to designate the region of the head lying between the antennæ, the eyes, and the mouth.

the males with yellow pubescence, and a yellow circle round the eyes; the hypostome yellow in the females, with a dark line down the middle; forehead black and shining, the hinder part of the head yellow: thorax dark-brown and unspotted, clothed with light brown hairs; scutellum yellow, with a triangular black spot at the base, the spines frequently tipped with the latter colour: abdomen considerably wider than the thorax, pubescent, and of a deep black above, the second, third, and fourth segments, having a triangular spot of citron-yellow on each side, the anterior pair large and triangular, the others narrower and more elongate; the anal segment with a triangular spot of the same colour in the centre: on the under side, the abdomen is dull yellow, with a narrow oblique black streak on both sides of the second and third segments, sometimes united into a continuous band on the latter, and the terminal segment edged with black: the scales at the base of the wings and the halteres yellow, the wings pale brown, the principal nervures inclining to ferruginous; legs nearly of the latter colour, the thighs brown except at the base. Length $7\frac{1}{2}$–8 lines.

The chamæleon fly was so named by Goedart, because he found that it could subsist a very long time without food, a property for which that animal was long considered famous. It is not so often met with in most parts of England and Scotland as some of the following species, but it may be found occasionally throughout the summer by the sides of ponds and in marshy situations, hovering about the flowers of Caltha palustris and other marsh plants. Sides of Duddingston Loch, Braid marshes, and other similar places round Edinburgh, but not frequent. "Cardew Mire."—*T. C. Heysham, Esq.*

2. Stratiomys Potamida.

Meig. *Zweiflugeligen Insecten*, Vol. iii. 137.—Stratiomys Potamida, *Stephens's Cat.* No. 8469.

About the same size as the preceding, to which it bears so close a resemblance that it might readily be taken for a variety; it is Meigen's opinion, however, that it is decidedly distinct, as indicated by the following characters: the scutellum, instead of having a triangular spot at the base, has a black band, continued across the surface and turned over the sides; the scutellar spines always entirely yellow; the second segment of the abdomen bears two lateral triangular spots, as in *S. chamæleon*, but on the hinder margin of the third there is a yellow band, narrow and continuous in the female, broader and interrupted in the male; the fourth segment with an entire band in both sexes; anal segment with a yellow triangle: under side of the abdomen yellowish, with four narrow black bands, the

first always, and the second sometimes, interrupted: in other respects corresponding to *S. chamæleon.*

Occurs at times along with the preceding species, and is said to have been taken in the vicinity of London. "Monks Wood, Hunts." —*Charles C. Babington, Esq.*

3. Stratiomys furcata.

Stratiomys furcata, *Fabr. Meig. Stephens.*—Stratiomys panthaleon, *Fallen.* —Musca singularius, *Harris, Expos.* pl. xi. fig. 2.

Head and antennæ black, the former with light grey pubescence, two narrow yellow streaks over the insertion of the antennæ, and two marks of the same colour on the crown: thorax pitch-brown, pretty thickly clothed with greyish hairs; the scutellum, together with its two spines, yellow, and having a triangular black mark at the base: abdomen slightly clothed with short pubescence similar to that on the thorax, the ground colour black, the sides with several straw-coloured spots; viz. a pretty large triangular one on each side of the second segment extending a little way over the anterior edge of the third segment; two sublinear marks on the latter emitting an obtuse salient point at the inner end directed forwards, and likewise extending across the incisure behind; two elongate ones on the fourth segment, and the usual triangular mark at the extremity: underside of the abdomen black, with four irregular straw-coloured fasciæ, narrowed on each side to a point and not reaching the margin; thighs dark-brown, the tarsi and greater part of the tibiæ pale yellow: wings tinged with ferruginous anteriorly. (*See Fig. 4th of the last wood-cut.*) 7–8 lines.

Scarce; has been taken near London, and in a few other places. "In ponds, Holywood, on Belfast Lough, County Down: at Killarney."—*A. H. Haliday, Esq.*

4 Stratiomys riparia. (s.)

Meig. *Zwei.* iii. 138.

Head of the male black, in the other sex marked like that of the female of *S. furcata,* in both clothed with long whitish pubescence: thorax thickly covered with reddish-yellow hairs, the surface pitchy brown; scutellum and spines yellow, the former more or less marked with black at the base: hinder margin of the second, third, and fourth segments of the abdomen with a white or yellowish stripe on both sides, the anal one with a triangle of the same colour; the rest of the surface black; under side with three white bands not reaching to the edge, and the anus margined with the same colour: legs pale, the thighs and hinder portion of the tibiæ brown; the wings brown slightly tinged with yellow, and having dark nervures. 6 lines.

Once taken near Duddingston; likewise found in the vicinity of London, and in other parts of England.

5. Stratiomys strigata. (s.)

Stratiomys strigata, *Fabr; Meig.* iii. 139.—Musca strigata, *Gmelin.*—Hirtea longicornis, *Scopoli, Ent. Car.*—Musca tenebricus, *Harris, Expos.* pl. xi. fig. 3 ♀?

Readily distinguished from any of the preceding by having the surface of the abdomen entirely black: head, thorax, and scutellum brownish-black, clothed with tawny hairs; the spines of the latter small and yellow: eyes greenish, pubescent, with two purple fasciæ, the anterior one very narrow; antennae black: abdomen black, thinly clothed with tawny hairs, the under side with three narrow yellowish-white bands narrowed to a point at each side, and placed on the hinder margin of the segments: thighs brown; tibiæ yellow with a brownish ring near the middle and another at the apex: the tarsi tinged with brown.

The female differs in having a yellow triangular spot between the eyes and another on the hinder part of the head; the pubescence on the latter is light-coloured, and on the sides of the abdomen it is nearly pearl-white. 6–7½ lines.

Apparently occurring more frequently in Britain than any of the preceding species. "Near London," *Stephens's Catal.* "New Forest," *J. C. Dale, Esq.** "Raehills," *Rev. William Little.*

Besides the above species, Mr Stephens possesses another true Stratiomys, which he names *S. triangulata*, the characters of which have not been published.

Genus ODONTOMYIA, *Meig.*

Antennæ longer than the head, the two first joints short and nearly of equal length, the third elongate and conical, divided into five distinct rings, the apex compressed and narrowed into a short style: proboscis rather slender; the labrum narrow and elongate; scutellum with two spines; eyes of the male with the facettes much larger on the upper than on the under side.

In its other characters this genus scarcely differs from the preceding. The two groups, indeed, are so closely allied that Meigen has latterly included both in his genus Stratiomys. This he has probably been induced to do by observing that the antennæ of *O. microleon* and *O. argentata* are of a structure nearly intermediate between the typical form of Stratiomys and Odontomyia, the first joint being a good deal longer than the second. With this exception, however, the

* Loudon's Mag. Nat. Hist. iv. p. 265.

species are sufficiently dissimilar to be entitled to a distinctive name. The larvæ, one of which is figured and described by De Geer, are aquatic, and seem in no respects to differ from those of Stratiomys.

1. Odontomyia argentata.

Stratiomys argentata, *Fabr. Meig. Zwei.* iii. 141.—Panzer, *Fauna Germ.* lxxi. fig. 20 ♂, cviii. fig. 10 ♀.—Odontomyia argentata, *Latr.*

Head and antennæ black, eyes greenish with a purple fascia, the forehead clothed with shining silvery hairs; thorax and scutellum dark-brown, with brownish-yellow pile, the scutellar spines small and inconspicuous; abdomen black, clothed throughout with silvery hairs, having a bluish tint, with an acute triangular yellow spot on each side of the second and third segment, and the anus likewise of that colour; under side black slightly tinged with green: wings vitreous, the nervures and a small spot near the middle of the costa brown; legs of the latter colour, the tibiæ ferruginous, with a brown mark near the middle.

The female differs chiefly in having the body of a deeper black and clothed throughout, except on the sides of the abdomen, with pile of a golden-green colour. 4½ lines.

Rare; has been found in the vicinity of London, and indigenous specimens are preserved in the British Museum, and likewise in the cabinet of the Rev. Mr Kirby, now in the possession of the Entomological Society of London. "Cambridge, 1832."—*Charles C. Babington, Esq.*

2. Odontomyia ornata. (s.)

Odon. furcata, *Meig. Klassif.* i. 129, pl. vii. fig. 22. Latr. *Gen. Crust.* iv. Reaumur, iv. pl. 24, fig. 4–7?

Eyes green and unspotted; antennæ and hypostome dark brown, the latter with yellowish hairs; thorax and scutellum dark brown, clothed with rufescent hairs, the scutellum margined with reddish-yellow, and the spines likewise of that colour, with the tip black; abdomen black above, and somewhat glossy; with fulvous triangular spots on the sides, and the anal segment edged with fulvous; the under side pale, having a pair of dusky spots on the third and fourth segments; legs ferruginous, the basal half of the thighs black, and the tibiæ and tarsi more or less spotted with brown; wings transparent, the nervures yellowish.—In the female the legs are entirely ferruginous, and the forehead of the same colour, with a black line in the middle, and a spot on each side. 6–7 lines.

In spring and summer, occasional. Occurs in Roxburghshire and near Edinburgh. "Near London," *Stephens's Catal.* "Dalmeny," *Rev. William Little.*

3. Odontomyia felina.

Stratiomys felina, *Meig. Zwei.* iii. p. 145. Panzer, *Fauna Germ.* lviii. 22? Musca Mycroleon, *Harris, Expos.* pl. xi. fig. 5.

Head and antennæ black, the hypostome with whitish hairs; thorax also black, clothed with yellow pile; the scutellum ferruginous posteriorly, the spines lighter: abdomen reddish yellow, with a broad black band along the back, dilated on the posterior segments, and leaving only a small portion at the sides yellow: under side pale green; legs ferruginous, the wings entirely transparent, with yellow nervures. 4–4½ lines.

Has been found in several parts of the country, but appears to be uncommon. "Cardew Mire," *T. C. Heysham, Esq.*

4. Odontomyia Hydropota.

Stratiomys Hydropota, Meig. *Zwei.* iii. 147.

About the size of the preceding or somewhat larger; the hypostome black, the region of the mouth rufescent; antennæ entirely ferruginous in the male, having the two lowest joints rufescent, and the terminal one blackish in the female; thorax shining dark-brown, pretty thickly clothed with hairs, which are whitish on the disk and tinged with yellow on the sides; scutellum with the margin and spines rufous, the latter small and tipped with black: abdomen pale green both above and below, somewhat pellucid, with a broad angular dorsal stripe, rather widest at the base, and not extending quite to the hinder extremity: legs rufous. The female has the head rufescent, with a deep black line on the forehead, the crown black, a white spot near the inner margin of the eyes, and two ferruginous spots on the vertex, the dorsal stripe wider than in the male. 5½ lines.

Not of frequent occurrence; inhabits the vicinity of London.

5. Odontomyia Hydroleon.

Stratiomys hydroleon, *Fabr. Meig. Zwei.* iii. 148. — Musca hydroleon, *Linn.*; *De Geer*, vi. pl. 9, fig. 4.—Odontomyia hydroleon, *Latr. Stephens.*

Head and thorax black, the latter with yellowish gray pubescence, the former having the hypostome clothed with fine white hairs; antennæ dark-brown; eyes green; scutellum the colour of the thorax at the base, the apex rufous, as well as the spines, which are tipped with black; the abdomen is of a clear green both above and below, the middle of the back occupied by a broad deep black stripe dentate on the sides, and not reaching either the lateral or hinder edges. The legs are pale ochreous, the hinder tibiæ usually with traces of a brown ring near the middle; wings very clear and transparent, the nervures yellow; halteres white. In the female the head is ful-

vous, the hypostome with two black points anteriorly, and the crown with another black spot; the margin of the eyes yellow; the pubescence on the thorax is yellowish-green, and scutellar spines entirely yellow. $3\frac{1}{2}$–$4\frac{1}{2}$ lines.

Not so plentiful as the following, but occurring now and then on banks and in meadows. "Cardew Mire," *T. C. Heysham, Esq.* "In ponds, Holywood: Killarney, &c." *A. H. Haliday, Esq.*

6. Odontomyia viridula. (s.)

Stratiomys viridula, *Fabr. Panzer, Fauna Germ.* lviii. 18. *Meig. Zwei.* iii. 149.—Odontomyia viridula, *Latr. Gen. Crust.*

Head and antennae blackish, the former with whitish silky pubescence; eyes green, with a purple band; thorax entirely clothed with short hairs of a golden or brassy colour; the hinder margin of the scutellum and the two spines yellowish: abdomen yellowish-green both above and below, with a black band along the back, rather narrow, and widened posteriorly in the male, but broad in the female, and widening suddenly on the third and fourth segments; legs entirely yellow; halteres whitish; wings with yellow nervures, and having a single submarginal cell. 3–$3\frac{1}{2}$ lines.

A species of frequent occurrence in damp meadows, and on the margin of ponds, &c. throughout England and the south of Scotland during the summer months. Taken plentifully about Edinburgh. "Chelsea," *Rev. A. Badger.* It is probably distributed over the whole island.

7. Odontomyia tigrina.

Musca tigrina, *Gmelin.*—Stratiomys tigrina, *Fabr. Meig. Panzer, Faun. Germ.* lviii. fig. 20.—Odontomyia tigrina, *Latr. Stephens.*

Head and antennæ black, the hypostome in the female with grey hairs; eyes with a purple fascia; thorax black, with pubescence of the same colour in the male, but the pubescence in the female yellowish, inclining to green when seen in certain lights; abdomen entirely black above, rufous beneath, the under side of the female widely margined with black; legs ferruginous, the thighs nearly all brown, and the tibiæ having a patch of that colour towards the middle. $3\frac{1}{2}$–4 lines.

Has been taken near London and elsewhere, but appears to be rare.

Genus CLITELLARIA, *Meig.*

Antennæ about the length of the head, the two first joints nearly equal, short and somewhat cup-shaped, the third thicker and conical, five-ringed, and terminating in a two-jointed style, (Fig. 1;)

labrum short and horny, placed at the base of the labium, the apex notched (Fig. 2, *b*;) palpi triarticulate, the third joint ovate, pubescent, (Fig. 2. *a*;) scutellum semicircular, armed with two spines.

The genus Clitellaria of Meigen corresponds to that named Ephippium by Latreille. The former of these authors includes in it the *Nemotelus villosus* of Fabr. and two other species which are destitute of spines both on the thorax and scutellum, besides differing in some other particulars from the insect described below. As it seems improper to associate species so dissimilar in structure, the genus has been defined above, so as to restrict its application to the kinds provided with a spinous scutellum, all of which, with a single exception, are exotic. The name used by Latreille may be applied to the others.

1. Clitellaria Ephippium.

Musca ephippium, *Gmelin, Donovan,* xvi. pl. 559.—Stratiomys ephippium, *Fabr.*—Ephippium thoracicum, *Latr. Gen.* iv. 276.—Clit. Ephippium, *Meig. Zwei.* iii. 122, *Stephens, Catal.*

Head black, the female with two small white spots on the forehead; thorax clothed with silky pubescence of a bright-red colour, the breast and sides black; before the insertion of the wing on each side, there is a pretty long projecting spine; scutellum and its two spines, likewise the abdomen and legs black; halteres yellow; wings reddish-brown. $4\frac{1}{2}$–5 lines. *(See Fig. 3 of the above cut.)*

This insect is apparently scarce in Britain, but it is sometimes found near London. "Coombe Wood by George Milne, Esq.—Kent," —*Donovan, l. c.*

Genus OXYCERA, *Meig.*

Antennæ rather shorter than the head, approximating at the base, but diverging anteriorly, the two first joints nearly equal, subcylindrical, somewhat widened at the apex, and pilose, the third as long as both the others, tapering to the extremity, and divided into four rings, the apex with a two-jointed style, generally inserted on the back just before the summit, (Fig.

l ;) thorax and abdomen oval, the latter somewhat convex ; scutellum with two posterior spines : eyes slightly pubescent in the males.

This genus approximates pretty closely to *Clitellaria*, but is sufficiently distinct. The species, which are not numerous, are all of small size, some of those found on the continent being even very minute : and they are prettily coloured, with the abdomen generally fasciated or spotted at the sides with yellow. They frequent flowers and foliage, usually in the vicinity of ponds and other collections of water. The larvæ seem to be unknown.

1. Oxycera pulchella.

Meig. *Zwei.* iii. 125, pl. 25, fig. 29, ♀. Musca hypoleon, *Donovan*, v. pl. 146. fig. 2.—Musca tardigradus, *Harris, Expos.* pl. xi. fig. 6.

Head and antennæ black, the forehead with two silvery pubescent spots in the male, yellow in the female, with a black line in the middle ; the hypostome and space behind the eyes likewise yellow in the latter sex ; eyes with a purple band : thorax black, margined on the sides with yellow from the front to a little behind the base of the wing, beyond this a triangular yellow spot on each side of the scutellum ; the latter yellow, the spines tipped with black ; abdomen black, with a pretty large oblique yellow spot on each side of the third and fourth segments, and a triangular one at the extremity ; in addition to these, the female has a yellow mark on the first segment, just below the scutellum ; under side of the abdomen black, the second, third, and fourth segments more or less yellow in the middle ; legs yellow, upper half of the thighs black, and the terminal joints of the tarsi likewise of that colour. About 3 lines in length. (*Preceding wood-cut, fig.* 2.)

Battersea Fields and other places in the vicinity of London. "Near Portland, on 24th June 1831."—*J. C. Dale, Esq.*

2. Oxycera trilineata.

Stratiomys trilineata, *Fabr.*—Musca trilineata, *Linn.* ; *Donovan*, v. pl. 151. fig. 5.—Musca Hydroleon, *Harris, Expos.* pl. xi. fig. 4.

Nearly of the same size as the preceding, the prevailing hue green, or yellowish-green, the one colour sometimes predominating and sometimes the other ; antennæ yellow, the forehead of the female with three black streaks, the lateral ones abbreviated ; thorax with three black longitudinal lines approximating, sometimes confluent, at both ends ; scutellum with its spines of the same colour as the body ; abdomen with irregular transverse black bands on the back, not reaching the margin, and frequently having the ends turned forwards so as to give them a crescent shape ; legs and halteres yellow ; wings vitreous.

Apparently a scarce insect, but found occasionally near London and in other parts of England. "Cardew Mire".—*T. C. Heysham, Esq.* "Marshes, Ireland, common."—*A. H. Haliday, Esq.*

3. Oxycera muscaria.

Stratiomys muscaria, *Fabr. Panzer, Fauna Germ.* cviii. 15 ♂, 16 ♀.—Meig. *Zwei.* iii. 125.

Head black, the forehead, crown, and hinder margin of the eyes yellow in the female; thorax in the male shining black, with an interrupted lateral stripe of yellow, and a spot of the same colour beneath the insertion of the wing; in the female yellow, with three black longitudinal lines, and a small black spot at the base of the wings; scutellum and spines wholly yellow; abdomen black and shining, with triangular yellow marks on the sides, nearly semicircular in the female, which are united at the margin; anus yellow; under side of the abdomen black, the incisures and the outer margin edged with yellow; halteres and legs of the latter colour; the wings nearly hyaline, with yellowish-brown nervures. 2 lines.

Probably a scarce species in Britain; it occurs near London; but very few British localities have hitherto been cited for it. It is pretty widely distributed over the continent of Europe.

4. Oxycera formosa.

Meig. *Zwei.* iii. 127.

Nearly of the same size as the preceding; shining black, the forehead of the females yellow at the sides; thorax black, with the sides yellow, that of the females with two additional yellow lines united in front to the marginal stripe; scutellum with its two spines pale-yellow; abdomen black, that of the male with two lateral yellow spots, that of the female with three; the anus likewise yellow. 2 lines.

Not having seen examples of this and the two following species, recourse has been had for their distinctive characters to the descriptions of continental naturalists. The only notice which we have seen of their occurrence in Britain, occurs in a communication by Mr Dale to Loudon's Magazine of Nat. History, and wishing that no species recorded as indigenous should be omitted in these descriptive notices, they are accordingly inserted on his authority. The insect above described was found at Mullet's Copse, near Glanville's Wootton.

5. Oxycera terminata.

Megerle; Meig. *Zwei.* iii. 130.

Head shining black, base of the antennae ferruginous; forehead

with a white spot before the ocelli ; thorax with a lateral line of sulphur-yellow on each side extending to the base of the wings ; scutellum and spines sulphur-yellow ; anus with a semicircular pale-yellow spot ; halteres whitish ; legs reddish-yellow, the hinder thighs brownish before the apex. $2\frac{1}{2}$ lines.

" Glanville's Wootton."—*J. C. Dale, Esq.*

6. Oxycera analis.

Meig. iii. 130 ; Megerle.

Somewhat larger than the preceding, to which it is very similar : antennæ entirely black ; thorax with a yellow lateral line, the scutellum and a mark above the anus of the same colour ; wings with a fuscous spot ; thighs entirely black, except a small portion at the apex, the hinder tibiæ marked with a dark-brown spot. $2\frac{2}{3}$ lines.

" Mullet's Copse ; Glanville's Wootton."—*J. C. Dale, Esq.*

Genus NEMOTELUS, *Geoff.*

Antennæ nearly as in *Oxycera*, the two first joints being almost equal, the third elongate, divided into four rings, and having a short two-jointed style at the extremity, (Fig. 2 ;) inserted at the apex of a conical hypostome projecting in the form of a beak, and covering the proboscis, which is long, slender, geniculated and without distinct lobes ; labrum long, narrow, and pointed ; palpi very minute, if they exist at all ; thorax subquadrate ; abdomen oval, scarcely wider than the head ; scutellum unarmed ; halteres uncovered.

The short conical beak readily distinguishes this genus from others of the family. The species are rather of small size, few in number, and frequent marshy places ; the larvæ probably inhabiting stagnant pools. As in most of the allied genera, the sexes are distinguished by the size of the eyes, those of the male being large, and meeting at their inner edges, while in the female they are smaller, and separated from each other by a considerable space.

1. Nemotelus uliginosus. (s.)

Musca uliginosa, *Linn.* ; *Donovan*, xv. pl. 519. Nemotelus uliginosus, *Fabr.* ; *Meig. Zwei.* iii. 114, pl. 25, fig. 19, ♀.

Head black, with a white spot over the antennæ in the male, which

assumes the form of an interrupted white line in the female; thorax shining black, with fine grey pubescence, having a white lateral line on each side extending from the shoulder to the insertion of the wing; scutellum concolorous with the thorax; abdomen of the male white, with the base black and a spot of that colour at the apex; that of the female black margined with white, having a row of small white triangular marks down the middle, and another on each side; the spots of the latter united to the white margin: thighs black with the apex white, all the rest of the leg of the latter colour, except the hinder tibiæ, which are black in the middle; wings vitreous, the costal nervures yellowish. 3 —3¼ lines.—(*Wood-cut, Fig.* 1*st.* ♀)

Found occasionally on flowers in marshes and damp meadows from May to August, probably inhabiting most parts of the country. "On Umbelliferæ, common in Ireland."—*A. H. Haliday, Esq.*

2. Nemotelus pantherinus.

Musca pantherina, *Linn.*—Nemotelus marginatus, *Fabr.*—Nemotelus pantherinus, *Meig. Zwei.* iii. 115, pl. 25, fig. 20, ♂.

Very closely resembles the preceding in its general appearance, but is considerably less, seldom exceeding 2 or 2¼ lines. Head of the female without any white mark over the base of the antennæ; thorax pubescent, of a uniform black colour without any white marks; abdomen of the male white, with a black spot just before the apex; that of the female black, with a single dorsal series of small white spots: thighs black, white at the apex; tibiæ white, with a brown mark before the apex; tarsi entirely white. 2—2¼ lines.

Found with the preceding, but less frequently. "Near London," *Stephens's Cat.* "Cambridge," *Charles C. Babington, Esq.*

3. Nemotelus nigrinus.

Nemotelus nigritus, *Panzer, Fauna Germ.* cvii. 17.—Nem. nigrinus, Fallen, *Diptera Suecicæ.*—Meig. *Zwei.* iii. 117.

Considerably less than either of the preceding; head shining black, antennæ brown; thorax with a yellow humeral dot, from which a yellow line extends to the base of the wings; the other parts of the thorax and the whole of the abdomen shining black in both sexes; halteres and legs white, slightly tinged with yellow; thighs black, except at the apex; anterior tibiæ tinged with brown, the hinder pair nearly black. 1½—2 lines.

This likewise has occurred in the vicinity of London and in a few other places. "Bog of Allen; Connemara; Holywood," *A. H. Haliday, Esq.*

4. Nemotelus brevirostris.
Meig. *Zwei.* iii. 117.

The most distinctive mark in this small species is in the form of the rostrum, which is very short and truncated; the prevailing colour of the body shining black, the antennæ brownish, and an interrupted white line above their base; thorax with a dilated abbreviated yellowish-white line on both sides; abdomen with a posterior whitish triangle on the second segment, a semicircular dorsal spot on the fourth, and a transverse white line at the extremity; legs yellowish-white, the thighs and hinder tibiæ black, with the apex yellow. $1\frac{1}{2}$ lines.

Rare; inhabits some parts of Middlesex, but no other British localities have hitherto been given for it.

Genus SARGUS, *Fabr.*

Antennæ very short, placed close together at the base, inclining sidewise, the radical joint subovate and truncate, pilose, the second cup-shaped and likewise pilose, the third nearly orbicular, divided into four rings, one of them very indistinct, and having a long naked seta attached to the upper side, (Fig. 1;) palpi wanting; labium large, fleshy and bilobed; the labrum short, and notched at the apex; maxillæ slender and acute, about the length of the labrum; eyes somewhat remote in both sexes; ocelli placed on the forehead, the anterior one generally somewhat remote from the others, (Fig. 2;) thorax with a cross suture most distinctly marked at the sides; abdomen flat, narrow, and much elongated in the male, shorter and wider in the female; scutellum semicircular, without spines; halteres rather long, subtrigonate; winglets wanting; basal joint of the tarsi as long as all the other joints taken together.

The flies included in this genus are insects of great beauty, being of very elegant forms, and ornamented with brilliant metallic colours. They are rather inactive in their habits, delighting to repose on the foliage of plants, particularly the glossy leaves of the laurel and other evergreens, during warm and sunny weather. They are seldom noticed on flowers, and several of the larger kinds shew no preference to marshy situations, like so many others of the same family, but frequent gardens, shrubberies, skirts of woods, &c.

They probably derive their nourishment from the saccharine juices which frequently exude from the leaves of plants. We are still imperfectly acquainted with their larvæ. One described by Reaumur was found to live in cow-dung. It was of an oblong figure, narrowing to a point anteriorly, and furnished with two hooks at the head, which is of a scaly texture. Its metamorphosis took place within the skin of the larva, and the fly made its exit by pushing outwards the portion that covered the head and first segment. *

1. Sargus cuprarius, (s.)

Musca cupraria, *Linn. Fabr.*—Nemotelus cuprarius, *De Geer*, vi. 200, tab. 12, fig. 4.—Sargus cuprarius, *Fabr. Syst. Ant.*

Forehead bluish-black, shining and pubescent, narrow in the males, somewhat wider in the females; antennæ brown, with a small white spot over the base of each; eyes brassy green during life, with a horizontal purple band a little above the middle, the superior space more or less inclining to that colour, particularly behind; thorax shining golden-green, pubescent, the sides blue-black; halteres pale yellow, or whitish; wings vitreous at the base, more or less clouded with brown in the middle, especially from the anterior margin across the discoidal cell; abdomen cupreous, shining and pubescent, the hinder parts more or less glossed with violet, the whole being of the latter colour in the female except at the base; the under side shining black inclining to blue; legs black, the tip of the thigh, base of the tibiæ, and some of the joints of the tarsi inclining to reddish-yellow. 4–5 lines.

This beautiful insect is found from May till August, and seems to be not uncommon in most parts of the country. It frequents gardens, shrubberies, and sheltered lanes, and is not observed much on the wing, but reposing on the foliage, as if enjoying the sunshine. It has been noticed in many parts of Scotland, and it is sometimes rather plentiful in the Botanic Garden of Edinburgh, and other places near the Scottish metropolis. The female is always much more plentiful than the male. "I found this splendid insect in abundance on the borders of a wood near Dover, on the 14th of July, and took a female in Scotland the same month."—*Curtis, B. E.* vii. fol. 305. "Near London," *Stephens.* "Dunkeld and Dum-

* Reaumur, *Memoires pour l'Histoire des Insectes*, iv. 348.—It is difficult to determine from his rude figure, (pl. 22, fig. 7–8,) what species of Sargus originated from this larva; it cannot be *S. cuprarius*, as De Geer and Latreille suppose, (*Regne Animal*, v. p. 487,) for the belly and legs are described as being pale yellow. Meigen conjectures that it is the species which has since been named *S. Reaumuri*.

fries-shire," *Sir William Jardine, Bart.* "Woods near Newby Cross, in the vicinity of Carlisle," *T. C. Heysham, Esq.* "Bath," *Charles C. Babington, Esq.* "Twizell," *P. J. Selby, Esq.* "Common in Ireland," *A. H. Haliday, Esq.*

2. Sargus infuscatus. (s.)

Meigen, *Zwei.* iii. 107.

Antennæ, head, eyes, and thorax as in the last; abdomen cupreous, glossed with violet behind, and entirely of the latter colour in the female, the base sometimes with a cupreous tinge: wings mostly suffused with dusky brown, the region of the stigma and discoidal cell darker than the rest, the base rather pale: legs obscurely fuscous. $4\frac{1}{2}$–5 lines.

By no means a scarce insect throughout Britain, and so closely allied to the preceding that the respective species are not readily distinguished; indeed there is every reason to believe that this is a mere variety of *S. cuprarius*. It is not very rare in gardens near Edinburgh, and in Dumfries and Roxburghshires. "Raehills," *Rev. William Little.* "Beginning of June, roads and gardens near London," *Curtis, l. c.* "Near Twizell," *P. J. Selby, Esq.* "Woods near Newby Cross," *T. C. Heysham, Esq.* "Bath: Needwood Forest, Staffordshire," *Charles C. Babington, Esq.*

3. Sargus nitidus.

Meig. *Zwei.* iii. 108.

Very closely resembling the two preceding insects in its general appearance, but differs in being considerably less, and in wanting the purple band across the eyes. The wings are dusky, but not so dark as in *S. infuscatus*, and the stigma is obsolete; in other respects it nearly agrees with the species just named. 3 lines.

Apparently rare; it has been taken, however, near London. "At Portland, 28th June," *J. C. Dale, Esq.*

4. Sargus flavipes. (s.)

Meig. *Zwei. Insecten*, iii. 108. pl. 25, fig. 14.

Hypostome and forehead deep glossy black, with a bluish tinge, and two minute whitish points over the base of the antennæ; the latter dark-brown: surface of the thorax and scutellum brilliant golden green, sometimes glossed with copper-colour, the breast and sides black, all these parts thinly covered with whitish pubescence; abdomen shining copper-colour above, more or less tinged with steel-blue towards the apex, especially in the female; the under side near-

ly black; halteres pale yellow; wings brownish yellow, darkest about the discoidal cell; legs yellow, the thighs, particularly the anterior pair, and frequently the extremity of the tarsi, slightly tinged with dusky. Length about 4 lines.

Not a very abundant species, but found occasionally throughout England and in the south of Scotland. In the vicinity of Edinburgh it has been taken at Duddingston, and in the Botanic Garden; likewise in Roxburghshire and East Lothian. "Near Dorchester," *J. C. Dale, Esq.* "Bath," *Charles C. Babington, Esq.* "Not rare in Ireland," *A. H. Haliday, Esq.*

5. Sargus Reaumuri. (s.)

Fabr. *Syst. Antl.* 256.—Meig. *Zwei. Ins.* iii. 109.—Curtis, *Brit. Ent.* vii. 305. ♀

In this beautiful species there is a remarkable discrepancy in the appearance of the sexes, the female being conspicuously distinguished by having the base of the abdomen of a bright red; in both sexes the head and antennæ are blackish, the hypostome blue-black; two white spots over the base of the antennæ, the ocelli placed on the crown almost at equal distances from each other, the anterior one not being so remote as in any of the preceding species: thorax bright golden-green above, and bluish or greenish black beneath, each side with a whitish longitudinal line, separating the two colours: abdomen in the male long and narrow, of a uniform light copper-colour, clothed on the sides with rather long whitish hairs standing at right angles with the surface; in the female the two first segments red with a quadrate violaceous spot on the back of the first segment, and an elongate-ovate one on the second, the remaining segments shining steel blue, with ochreous pubescence: halteres and legs ochreous yellow, the tarsi blackish towards the tip: wings light brown, slightly iridescent, the nervures piceous. Length of the male 6 lines; of the female 4½–5. *(Woodcut, p.* 160, *fig.* 3. ♀ *)*

Scarce, but occurring at times in many parts of the country. A considerable number of both sexes were once taken by Mr Duncan in an open and marshy part of a wood on the banks of the Tiviot, in the month of August, and others have been noticed in the vicinity of Edinburgh. "Rockcliff Moss, Cumberland, taken on 5th July by T. C. Heysham, Esq.; and I possess a specimen which was found, I believe, in Kent." *Curtis, B. E.* vii. fol. 305. "Braid Hills, near Edinburgh," *Dr Stark.* "Jedburgh," *Rev. William Little.* "Holmes, Roxburghshire," *Sir William Jardine, Bart.* "Twizell, occasional," *P. J. Selby, Esq.*

Genus CHLOROMYIA, *Nob.*

Antennæ rather short, the two first joints nearly as in *Sargus*, the third ovate or elliptical, with the rings rather distinctly marked, the seta pubescent at the base ; (Fig. 1,) palpi two, three-jointed, the first joint short and cylindrical, the second likewise cylindrical, but slender, the third globular and pubescent, (Fig. 2. *b*.) Maxillæ very minute, or wanting : eyes united in the male ; ocelli placed near each other on the crown : abdomen not much elongated and rather wide ; scutellum and halteres as in *Sargus*.

The distinctive characters of the insects included in the present genus were first accurately pointed out by Meigen, although he improperly allowed them to remain as a sectional division of Sargus. The same plan was followed by Macquart, but the differences between the two are far too important to allow this connection to be maintained with propriety. In colouring and aspect, these flies are not unlike the Sargi, but they differ somewhat in their habits, and are much more frequently found on flowers. The species first described differs from the others in having the eyes pubescent, and the terminal joint of the antennæ considerably elongated ; that articulation in C. polita and C. flavicornis inclining more to an orbicular shape, as among the true Sargi.

1. Chloromyia formosa. (s.)

Shrank, Meig. *Zwei.* iii. 110. Musca aurata, *Fabr. Donovan*, iv. pl. 142. fig. 1. Nemotelus flavogeniculatus, De Geer, vi. 81. Sargus xanthopterus, *Fallen, Latr.*—Sargus auratus, Fabr. *Syst. Ant.* 257. 4. Musca Cicur, *Harris, Expos.* pl. xi. figs. 8, 8, (left hand fig. ♂, right hand ♀.)

Hypostome shining black, with rather long ochreous pubescence ; eyes likewise pubescent, greenish during life, with a purple band ; antennæ brownish-black : thorax shining golden-green, sometimes glossed with violet in the female, covered throughout with rather long ochreous hairs ; abdomen of the male bright brassy or golden-yellow, that of the female strongly tinted with violet blue, changing according to the direction of the light, in both sexes clothed with ferruginous hairs, which are longest in the male, and seen most distinctly when viewed from the head ; under side of the body and sides of the breast black, shining, and rather sparingly pubescent ; the belly of the female bluish ; legs brownish-black, the apex of the thighs and base of the tibiæ reddish-yellow ; halteres pale yellow ; wings

of a uniform yellowish-brown, with the nervures darker. $3\frac{1}{2}$ to 4 lines. *(Preceding wood-cut, fig. 3.)*

A beautiful and very distinct species, occurring rather plentifully on flowers in meadows and marshes, during the months of June, July, and August. Near Edinburgh it is found in many situations, and occasionally in great abundance on the irrigated meadows between Portobello and Leith. "Near London, "*Stephens's Catal.* "Raehills, Dumfries-shire," *Rev. William Little.* "Holmes, Roxburghshire," *Sir William Jardine, Bart.* "Woods near Newby Cross," *T. C. Heysham, Esq.* "Bath," *Charles C. Babington, Esq.* "Common in Cruciferæ, in Ireland," *A. H. Haliday, Esq.*

2. Chloromyia polita. (s.)

Musca polita, *Linn.* Sargus politus, *Fabr. Syst. Ant.*; *Meig. Zwei.* iii. 111. Nemotelus auratus, *De Geer*, vi. 81. Musca vitreus, *Harris, Expos.* xi. fig. 9 and 10, ♂.

Colour of the body golden green, the surface highly polished and shining, the pubescence being so short and scattered as to be scarcely perceptible; eyes brassy-green, without pubescence; antennæ dark-brown; forehead of the female shining green, sometimes inclining to blue; abdomen slightly tinged with copper-colour, and having a violaceous play of colour in the female; under side of the body black, the legs yellow with the thighs black, except at the apex, the hinder and sometimes the intermediate tibiæ brownish near the apex; halteres pale yellow; wings vitreous, very slightly tinted with yellow, iridescent, the nervures brown. $1\frac{3}{4}$–2 lines.

Rather a common fly throughout the south of Scotland during the summer months, and apparently equally plentiful in England. "Near London," *Stephens's Catalogue.* "Isle of Wight and London," *Curtis, B. E.* vii. fol. 305. "Neighbourhood of Twizell," *P. J. Selby, Esq.* "Woods near Newbigging Hall," *T. C. Heysham, Esq.* "Needwood Forest, Staffordshire," *C. C. Babington, Esq.* "Common in hedges in Ireland," *A. H. Haliday, Esq.*

3. Chloromyia flavicornis. (s.)

Meig. *Zwei.* iii. 112.

About the size of *C. polita*; antennæ yellow; thorax shining golden-green, glossed with blue posteriorly; abdomen yellowish, with a blue play of colour; legs pale-yellow, the hinder thighs black, with the base and apex yellow, the hinder tibiæ tinged with brown before the apex; halteres and wings as *C. polita*.

This species was first described by Meigen, from a specimen

transmitted to him by Dr Leach, which was taken in England, probably in Devonshire, There seems reason to suppose that it is only a variety of C. polita, as that species evidently varies considerably, and in ordinary specimens the base of the antennæ are frequently yellow. In an example of *C. flavicornis* taken last summer in Roxburghshire, the legs are entirely pale-yellow, the hinder thighs scarcely tinged with brown. If carefully sought after it will probably be found not to be rare.

" Once taken at Dover," *Curtis, B. E.* vii. fol. 305. " Dumfriesshire," *Sir W. Jardine, Bart.* " Common in Ireland, along with *C. polita*," *A. H. Haliday, Esq.*

Genus PACHYGASTER, *Meig.*

Antennæ small, approximating at the base, turned obliquely outwards anteriorly, the radical joint minute, the second larger and transverse, the third large and spherical, divided into four very indistinct rings, and having a slightly pubescent seta attached to the outer side near the extremity, (Fig. 1 ;) palpi inserted at the base of the maxillæ, very minute, (Fig. 2, *a* ;) labrum robust and cylindric, the apex obtuse and slightly notched, (Fig. 2, *b* ;) tongue about half the length of the labrum, horny, and attenuated from the base to the apex, (Fig. 2, *c* ;) maxilla long, slender, and acute, (Fig. 2, *d* ;) eyes approximating in the males ; ocelli three ; thorax with a transverse suture ; scutellum without spines ; abdomen much wider than the thorax, subglobose ; halteres large and ovate.

This genus was constituted by Meigen, and is synonymous with that named *Vappo* by Fabricius and Latreille. It includes only two species, one of which does not appear to be known to continental naturalists. They are both minute insects, of obscure colours, and frequent woods and gardens. The larva of *P. ater* is described by Macquart as elongated, of a reddish-grey colour, and marked with three obscure longitudinal bands.

1. Pachygaster ater.

Vappo ater, *Fabr. Latr.* Sargus pachygaster, *Fallen.* Nemotelus ater, *Panzer*, liv. fig. 5 ; Meig. *Zwei.* iii. 102, pl. 24, fig. 17.

Body black, smooth and shining, marked with minute punctures ;

antennæ brownish in the male, ferruginous in the female, the seta in both sexes pale-yellow; eyes dark-green, the forehead of the males with a whitish play of colour; the abdomen is convex above, but flat on the under side, the incisures very faintly marked; legs pale-yellow, the thighs black; halteres with the knob dark-brown, the stalk yellow; wings with the lower half brown, the upper half vitreous. 2 lines. (*Woodcut, fig.* 3.)

Not a very scarce insect, usually found in July and August in hedges and woods. It is not unfrequent in woods near London, and has been noticed in many other parts of England. "Cambridge; Bath," *Charles C. Babington, Esq.*

2. Pachygaster Leachii.

Stephens's *Cat.*—Curtis, B. E. i. pl. 42.

Body black and shining, minutely punctured; antennæ reddish, (in the female,) the eyes likewise inclining to that colour during life; legs pale-yellow, the hinder thighs with a small black spot near the apex; halteres brownish; wings entirely hyaline, with pale-brown nervures. $1\frac{1}{2}$ lines.

First discovered in Devonshire by Dr Leach, and subsequently taken in the same county by Mr Curtis, but it appears to be rather a rare species. "Near Wareham Harbour, Dorset," *J. C. Dale, Esq.* "Madingley Wood, near Cambridge, in July," *Charles C. Babington, Esq.*

VI.—*Notice of the Lutjanus rupestris of Bloch.* By P. J. Selby, Esq. F. R. S. E., &c. Pl. VI.

After the reflux of the extraordinary high tide, so severely felt along the whole of the eastern coast of the island, on the 20th of February 1836, produced by the concurrent effects of a long-continued southern gale and a spring tide, numbers of fish of different kinds, evidences of the convulsed and unusually agitated state of the ocean, were, with other matters, thrown dead upon the shore far beyond the usual line of high water-mark. The species which suffered most upon the northern parts of the Northumberland and Berwickshire coasts, so far as I have been able to ascertain, belonged to the *Labridæ* (Wrasses) which may be attributed to the habits of the group, most of which affect a hard or rocky bottomed sea, though I am informed that in some parts where a sandy bay or soft bottom occurred, soles and other flat fish were also thrown out in considerable numbers. The species noticed, most-

ly belonged to the *Labrus maculatus*, Yarrell, (Ballan Wrasse,) but three specimens of a different kind were fortunately preserved, two of which, picked up in Berwick Bay, were secured by Dr Johnston, the third found near Barncleugh, was sent to me, a day or two after the event which cast them on shore. Upon consulting different ichthyological writers, these fish appear to be identical with Jago's *Goldsinny*, as figured and described in Ray's Synopsis Av. et Pisc. App. p. 163, fig. 3, where the rude engraving accurately expresses the specific markings of the species; and with Bloch's *Lutjanus rupestris*, whose detailed description and figure also agree in every respect with the specimens in question. It does not appear, however, to be the Goldsinny of Pennant and subsequent writers, who under that name have figured and described a different species. This error seems to have originated with Pennant, who having never seen or examined the true Goldsinny of Jago, has incorporated in his slight notice of that fish the description of another species, to which his figure refers. Bloch seems to have entertained this opinion, for although he has quoted Pennant's Goldsinny as a synonym of his *Lutj. rupestris*, supposing it to refer to Jago's fish, he afterwards, in the last paragraph of his description, remarks, that the fish described and figured by Pennant could scarcely be the same as the Goldsinny of Jago, or his *Lut. rupestris*, as it differed from it in figure, peculiar markings, and in the number of the hard rays of the dorsal fin. The true Goldsinny seems to have escaped the notice of subsequent writers, as the figures and descriptions we possess are all referable to the other species, distinguished by a black or dark spot at the base of the caudal fin, but always situated upon or rather below the lateral line, and not upon the upper edge of the base of the tail, as in the true Goldsinny of Jago; it also wants the black patch upon the anterior portion or rays of the dorsal fin; both of which specific characters are accurately displayed in Bloch's figure, as well as in the less finished engraving in Ray's Synopsis.

Mr Yarrell, to whom a specimen has been submitted, considers it as distinct from any of the species described in his beautiful work on the British fishes, though he thinks, and we agree with him, that the small figure constituting the vignette to page 301, is perhaps referable to it rather than to the *Scale-rayed Wrasse*, the young of which it was supposed to be by M. Couch, but to which it bears very little resemblance. In that figure, taken from a specimen about three inches in length, the black spot at the upper part of the base of the caudal fin is expressed, but no indication of the other at the anterior part of the dorsal fin: in shape it agrees pretty well with my specimen. With

Crenilabrus luscus, the Labrus luscus of Couch's fishes of Cornwall, described and figured in the fifth volume of Loudon's Magazine of Nat. Hist. (Scale-rayed Wrasse, Yarr.) it cannot well be confounded, the proportions of the bodies of the two fish being very different, and the formula of the fin rays dissimilar. The corkwing of that able ichthyologist is evidently, from the wood-cut given, the same as the Goldsinny of M. Yarrell, who indeed quotes it as a synonym, and M. Jenyns's *Labrus Cornubicus*, in the manual of Br. Vert. Animals, is descriptive of the same fish, and not of the Goldsinny of Jago, although Ray's authority is quoted first. In its general form it approaches nearest to the *Crenilabrus tinca*, Yarr. (Gilthead,) but this fish is destitute of the two black spots, so conspicuous in the other; the number of the fin rays is also different, and the margins of the preopercle in the Gilthead are more strongly denticulated. The following is a description of the specimen in my possession, with a correct outline engraving of the natural size.

Description. Length, six inches and three-quarters. — General form resembling that of *Crenilabrus tinca*. Length of head alone, to head and body without the caudal rays, as one to three. Greatest depth of the body, exclusive of fin, about two inches, or rather more than a third of the length of the body. Thickness contained about twice and a-half in the depth. Dorsal line rounded, falling regularly, and continuous with the profile, with little or no depression at the nape. Jaws equal, teeth prominent, the anterior middle ones rather large, their tops bending inwards, about eighteen above, and twenty below; a second row of smaller ones behind in each jaw. Eyes rather large, placed high up near to the line of profile. Preopercle scaled, the ascending line strait, and finely denticulated, the under line slightly rounded. Opercle smooth, slightly sinuated below, emarginate above. Forehead smooth, lateral line following the contour of the body till it approaches the base of the dorsal fin, where it suddenly bends down, and is then continued in a strait line to the middle of the base of the caudal fin. The scales large, and thirty-five or thirty-six in number longitudinally. Dorsal and pectoral fins commencing upon the same line. Soft rays of the dorsal fin ending a little beyond the line of the terminating rays of the anal fin. Spiny rays of the dorsal rather short and nearly all of the same length, the soft rays longer and rounded. Pectoral fins large, rounded. Ventral fins with an elongated scale between them. The number of fin rays.

D. 18+9. P. 14. V. 1+5. A. 3+8. C. 15 and 2 short.

Colour. The general colour of the specimen I received when first found, was described as being of a rich pink or rose-colour, inter-

mixed upon the sides with golden yellow, and showing indications of darker transverse bands upon the back ; upon the opercle a spot of blue, continued towards the eye ; fins rosy pink mixed with yellow. Upon the anterior part of the dorsal fin a deep black spot or blotch, occupying the greater part of the membranes of the three first rays ; another upon the upper margin of the base of the caudal fin. These spots were similar in size and situation in Dr Johnston's specimens, and they continue unaltered in the spirits, although the other colours have faded to a pinkish brown.

As the specific title of Cornubicus has been applied to the other species, and described as the Goldsinny by various writers subsequent to Pennant, it is proposed to designate the present species as the *Labrus (Crenilabrus) rupestris*, (Jago's Goldsinny,) to which the following synonyms may be appended.

Goldsinny, Ray's Syn. Av. et Pisc. App. Catalogus quorundum rariorum, &c. D. Georgius Jago, p. 163, f. 3.

Die Seekarausche, Lutjanus rupestris, Bloch. Naturg. der Ausländischen fische, ii. p. 117, pl. 250, fig. 1.

VII.—*Observations on some circumstances attending the process of Exuviation in Shrimps and Lobsters.* By Jonathan Couch, F. L. S.

Dr Milne-Edwards, in his Histoire Naturelle des Crustaces, has given an account of what may be considered the present state of our knowledge, of the circumstances under which the process of exuviation is effected, and the methods by which it is accomplished in the long-tailed stalk-eyed crustaceans ; but as much of what that eminent naturalist advances is derived from other authorities, and I have reason to conclude, contrary to the general opinion, that the circumstances attending this process of nature, are different in even nearly allied species, there still remains space for enquiry.

Réaumur is our only original authority for the minute circumstances attending the process of exuviation, which he observed in the River Crayfish (Potamobius fluviatilis, Leach ;) but not having an opportunity of consulting that author's work, I copy his narrative from Dr M. Edwards's quotation : " A few days previous to the commencement of the operation, the creature abstains from all solid nourishment, and the carapace and abdominal segments will be found to offer less than the usual resistance to the pressure of the finger. Shortly afterwards the crayfish appears restless, and rubs its legs against each other ; it then throws itself on its back, agitates its whole body and then distends it, by which the membrane joining

the carapace to the abdomen is burst, and this great dorsal plate is raised. Some degree of rest follows these first struggles; but after a short time the animal again puts all its organs in motion, the carapace is seen to rise gradually from the legs beneath, and in less than half an hour, the animal has extricated itself from this portion of its slough. By retracting its head, the antennæ, eyes, and legs are withdrawn as from a case; and the extrication of the last, being the most difficult and complicated operation, is attended with so much pain, that the effort sometimes occasions the loss of one or more of the organs. The hinder parts are withdrawn with less difficulty; the head is conducted below the carapace, and the tail being thrown off by a forward motion attended with a brisk and distensive action, the creature is seen divested of all its encumbrances, and the case is left unbroken, as if no struggle had ever taken place within it.

I have no doubt that the process here described in the Cray-fish corresponds to what takes place in the common prawn (Palæmon serratus, Leach,) although I have never been able to observe it in operation;—the following is a description of the case from which the animal has recently extricated itself: The whole is thin, elastic and transparent; the carapace with its serrated process whole, the antennæ perfect to their minute extremities: the palpi and jaws drawn within the cavity of the thorax, and partially separated from the sternal plate; the latter with the legs still forming a loose attachment to each other, and without fracture, but drawn somewhat posteriorly into the thoracic cavity. The case and pedestal of one eye were within the thorax, but the other could not be found;—the legs perfect, and attached to the sternal plate. The caudal plates were united at their joints, but in no part was there any intervening membrane, this portion of the body not appearing to be thrown off with the more solid covering: a circumstance which will account for the fact, that the eyes do not long remain attached to the adjacent parts after the slough is left by its inhabitant.

The habits of the Lobster (Astacus Europeus, Leach,) at this periodical crisis, and the circumstances attending it, present a very considerable difference from those of the species already mentioned. So far from abstaining from food, it is not uncommon for it to be taken in crab pots, which it has been enticed to enter by the allurement of the usual bait; and instances have been related to me, where, when the fisherman commenced to handle his capture, the animal has slipped away, leaving an empty husk as the only reward of his labour. It was by a circumstance somewhat similar that the opportunity is afforded me of giving a minute description of a very perfect case,

left by the creature when it made its escape:—for escape it did, through an aperture too narrow to have allowed it to pass if its new covering had possessed a very moderate degree of firmness—to the no small annoyance of the fisherman, who had calculated on the possession of a prize somewhat above the ordinary magnitude. I cannot find that any extraordinary actions or contortions have been observed in the lobster, when engaged in delivering itself from its trammels, or that the time is prolonged, as is the case with the crayfish: circumstances which are easily accounted for by an examination of the crust; and it is certain that when delivered it possesses great activity in effecting its escape, and that neither the prawn nor the lobster devour, as has been supposed, any portion of the old shell.

In the specimen referred to, the case of the antennæ and palpi, was perfect to their minutest extremities; the stalk also, and transparent covering of the eyes, were uninjured, but the former was attached on its inferior portion only, the superior half hanging loose, so that it would soon have fallen away in the agitation of the sea. The segments and joints of the posterior portion of the body, with the caudal plates, were all joined together, but without any intervening membrane; and the inferior parts from beneath the snout, including the jaws and footjaws, chelædlegs, with the sternal plate, oesophagus and internal coat of the stomach, formed one connected portion, with no farther separation than arises from the absence of every portion of membrane. The whole of these inferior portions was drawn very considerably within the carapace; and it was the latter section of the surface only that showed a mark of the manner in which the animal had delivered itself from its case; and this it did in a way not to be mistaken. Through the middle of this space, ran a line as straight as if it had been cut with a knife, and evidently formed by a natural process of separation: for it even proceeded through the centre of the snout, to the terminal pointed process, at the root of which it turned off on the right side; so that the least effort of the animal was sufficient to afford it a passage.

The observation here made on a very perfect specimen that came into my possession by great accident, has been further confirmed by a careful examination, both of the living lobster, in which an obscure line is perceptible, where the natural separation takes place; and also of a specimen of small size, in which the sloughing or natural process of division had only begun. In the latter case a deep channel had been formed on the external part, nearly half through the carapace; while the internal portion still remained firm; but

I have little doubt that if the creature had lived but a few days longer, the separation would have been complete, and the animal would have escaped from its prison.

The growth of the young of the long-tailed Crustaceans, is well known to be exceedingly rapid ; and there seems reason to believe that the process of exuviation is repeated at least two or three times in the course of the first year of their age. In the course of a summer, among many prawns one or two may always be found in a state that indicates the having lately passed through this process ; but about October or November they all seem to undergo it at once, the breeding season finishes, and no further change in the shell takes place until the approach of the spring. It is not improbable that the general opinion is correct, which limits the exuviation of the adult animals to once in the year ; but from the marks of old injuries, and the incrustation of parasitic animals, I have come to the conclusion that in advanced age the lobster does not throw off its case with any regularity, and perhaps not at all.

REVIEWS AND CRITICAL ANALYSIS.

I.—*De l'Histoire Naturelle des Cétacés, ou Recueil et Examen des faits dont se compose l'Histoire Naturelle des ces Animaux.* Par M. F. Cuvier, de l'Académie des Sciences, de la Societé Roy. de Londres, &c. 8vo. Avec Planches xxiv. Pp. lii. and 416. Paris, 1836.

We had for some time been anxiously waiting for the appearance of this work; and as, on perusal, we have been somewhat disappointed, we think it best at once to say so. Our disappointment, however, may, to a certain extent, be our own fault; for we have so long been accustomed to connect all that is most admirable and wonderful in natural history with the name of Cuvier, that our associations and expectations concerning every thing coming from one bearing that honoured name have probably been too high. Another and more tangible cause of our disappointment has arisen from a misapprehension of the avowed object of the treatise, and as this may mislead others also, we take leave to point it out. The title does not bear that the work is a natural history of the Cetacea, but, in the words of our author, only a history of their natural history,—certainly quite a different, though a very important, subject. Not only is this clearly declared to be the ostensible object in the title-page, but the respected author takes early and frequent opportunity to press it upon the attention of his readers, "J'ai cru être utile à la science en retracant en quelque sort l'histoire de l'histoire naturelle de ces mammifères aquatiques," (xlix.); and again, "Bien loin d'avoir eu le project de donner l'histoire naturelle de cet ordre entier de mammifères, je n'ai pas même dû concevoir la pensée de donner l'histoire d'une seule de ses espèces." (iv.) Our author even goes further, the object of his introductory remarks being to prove, that the time has not yet arrived, when the natural history of the Cetacea can be judiciously or profitably undertaken.

It is no difficult matter to discover the circumstances which gave rise to this train of reflexion, and dictated these remarks. The sub-

ject is confessedly a difficult one, and has made less advance than many others in natural history ; the real facts collected concerning the order are comparatively few, and the fictions and errors are peculiarly numerous, so that every one who would presecute the subject is soon taught, that in using the accumulated mass of materials the greatest caution is necessary, and that much must be rejected, and but little adopted. This in fact has been the course pursued by all those who have lately taken up the subject ; the Baron Cuvier led the way in this most irksome but necessary task, and we may remark, that we know no portion of his labours which is more striking and successful than that in which he applied an enlightened criticism to the review of the alleged species of this order ; had then his brother done nothing more than presented to the public, in a portable and cheap form this work, which occupies a half of the fifth ponderous 4to on the *Ossemens Fossiles*, he would have rendered a most essential service to the cause of Cetology ; and had he systematically devoted his pen to the removal of the serious obstacles just alluded to, we should have been the first to appreciate and commend his labours.

But while M. F. Cuvier has most distinctly announced the nature and design of his work to be those which we have stated above in his own words, it is not possible to proceed far in the perusal of his volume without discovering, that he has soon entirely departed from his avowed purpose, and, for reasons which are not explained, has executed his work very much on the usual and common plan of such treatises on natural history. In fact, had we not been so distinctly and frequently advertised on the point, we should not have discovered that he had even contemplated making any difference between his plan and that of the other natural histories of the Cetacea which have appeared either in more remote or more modern times. Our author himself seems to be fully conscious that he has deviated from his proper design, and has thereby introduced a want of symmetry and unity which cannot be too much regretted. He states the work to be one " ou il devroit y avoir plus d'accord, plus d'ordre, et surtout plus d'unite." (p. l.)

An acknowledgment such as this seems to have anticipated, and so far as we are concerned, it disarms criticism ; and we should not perhaps have given the prominence we have done to the circumstance, had it not been necessary in the way of accounting for a very decided tone of criticism which pervades the work, and which will probably call for a vigorous defence from those living authors who have been assailed. There is, however, another feature of the work

which this circumstance does not so readily explain, which may be characterized under the name of innovation, and which assuredly should not have been employed to the extent it has been, without some very urgent and pressing necessity. In many particulars, indeed, M. Cuvier manifests a becoming respect towards the decisions of his illustrious brother, but in not a few instances he treats his opinions with as little ceremony as he does those of others, and rejects his proposals, and substitutes other views, which of course he regards as preferable. Thus, whilst he follows the new and admirable arrangement of the Baron with regard to the herbivorous Cetacea, and to the great whales, he very much forsakes and opposes him, and so innovates, in reference to that very numerous group which is intermediate between these two extremes. There can be little doubt that this is now the most perplexed and difficult part of the subject, and in illustration of the statement just made, and still more, as bearing very essentially on the future progress of the science, we judge it right to dwell somewhat more at large on the point.

Most of our readers are probably aware that some progress has been made in classifying these unnumbered, not to say innumerable species of smaller Cetacea. In the time of Bonnaterre, not fifty years ago, the genus Delphinus contained only nine species, but since that period this number has so much augmented, and is still so rapidly increasing, that it has long been felt necessary to break it up and subdivide it. It was the illustrious Lacépède who led the way in this division by the introduction of his *Delphinapterus*, including those which had no dorsal fin. Rafinesque Smaltz followed, by his discovering a species with two dorsal fins, which he named *oxypterus*. Baron Cuvier introduced a distinction founded upon what we may call the facial line of the living animal, thus separating the *Phocœna*, whose head and snout are uniformly curved to the extremity, from the *Delphinus*, which has a distinct fall or groove between the forehead and beak. Pursuing the same idea, Blainville introduced the *Delphinorhyncus*, which has a beak, which separates it from the phocenæ, and yet the beak not distinguished from the forehead, as in the dolphins, but on a uniform slope from the top of the head to the extreme point; and finally, Lesson has proposed to constitute the *Globiceps*, whose heads are almost wholly rounded like a globe, into a genus. Now these proposals have all, more or less, been adopted, and most of them, as the Delphinapterus, Delphinus, Delphinorhyncus, Phocœna, universally by later writers, such as Desmarest, Cuvier, Scoresby, Blainville, Lesson, &c. An-

other respectable individual who had adopted the majority of these subdivisions was M. F. Cuvier himself, who, in his Mammifères, for years has familiarly discoursed of Delphinapteri, Delphinorhynci, Phocænæ, &c. Being thus personally committed, and so many other respectable authors having long consigned works to futurity with these distinctions, we think nothing can be more apparent, than that the advance thus made should not on slight grounds have been abandoned. Our author, however, has so abandoned it, and this is the first of many innovations which he proposes. Thus, the Beluga or white whale, which for some sixty years has been universally ranked among the Delphinapteri, is no longer to be found in that genus; no more is it to be found among the dolphins, where it previously was, but, according to our author, it takes place among the porpoises.

The reasons which our author assigns for his innovations appear to us anything but satisfactory. After enumerating three of the sources whence generic characters have been drawn, *first*, the oldest one, the dental system, so useful in classification throughout the animal series; *secondly*, the organs of movement, proposed by Lacépède; and *thirdly*, what we have named the facial line, introduced by his brother,—"Mon frère y ajouta les formes de la tête de l'animal vivant, et en fit l'application aux dauphins dans la formation du groupe des marsouins,"—he assigns, as the only reason for setting these characters aside, that there are cases in which they are of no great moment, or are equivocal, or uncertain. In particular cases, and of the characters severally, this is true; but could M. F. Cuvier forget that this was probably as well known to his brother as to himself; and that still notwithstanding, these principles of classification were in part introduced, and were all distinctly stamped by the Baron's high authority.

The mode in which our author treats the genus Delphinorhyncus shows a contempt of authority, and a carelessness regarding classification and nomenclature, which astonished us not a little. He does retain the term Delphinorhyncus, and includes several species under it; but it is not the Delphinorhyncus which Blainville introduced, and which Desmarest, and Baron Cuvier, and M. F. Cuvier, and many others adopted; but it is quite a different Delphinorhyncus, based on a different ground,—not on the form of the head of the living animal, but on the form of the maxillary and intermaxillary bones of the dead,—a character, we may remark in passing, most obscure and objectionable. Regarding the established basis of the genus, described in his own words as "une tête sans

front, où le bec est tout d'une venu avec la crâne," he hints that the substitution of the term *Cephalorhyncus* might be advisable, and remarks that such a ground of distinction and division may probably, on more accurate information, be necessary! * Notwithstanding this proposal of a new generic name, he applies the term to an individual species,—to the *Delphinus cephalorhyncus*;—to an animal which Baron Cuvier described as the Cape porpoise, and which he himself had both described and figured as the *Phocæna Capensis*. The inaccuracy and inconvenience of referring the same name to a species and a genus, as here proposed for the Cephalorhyncus, is too manifest, we apprehend, to require any elucidation; but this inaccuracy is only in keeping with our author's mode of treating the dolphins. Generally he discourses of them as the first great subdivision of the ordinary Cetacea, which he divides into seven genera, and then he applies the term, *par excellence*, to *one* of those genera which, in his view, comprehends somewhere between sixteen and forty-four species. We need not say that much confusion, which could easily be avoided, is hence the necessary consequence.

Another instance of the boldness of M. Cuvier's criticism occurs in his treatment of that group which Desmarest, Blainville, Lesson, and others, had recognized under the term *Heterodon*. This was not proposed as a generic term, but was employed to comprehend a number of genera which, though not very closely connected, yet, with other resemblances, had this feature in common, that their teeth were very heterogeneous, very few, and sometimes rudimental and apparently absent. Among other genera this group included the NARWHAL, the DIODON, the HYPEROODON, the AODON, and the ZIPHIUS, which Baron Cuvier regarded as entirely toothless. After a few words of criticism, our author rejects the Aodon altogether, and loses sight of, or entirely metamorphoses, three out of five of the genera we have just named.

We must not leave this part of the subject without making a few remarks on the author's *Delphinus Rostratus*. The "history of the natural history" of this species is somewhat curious, and very clearly illustrates the error and confusion, which, without the most scrupulous care and honesty, is sure to be introduced. This animal was first brought into notice, from imperfect data, in 1817, by Baron Cuvier, under the trivial name of *Dauphin à bec mince*,† and he attached to it the synonym of the *Rostratus of Shaw*. In 1823, (Oss. Fos.) he associated this *bec mince* with a specimen sent from Lisbon by M. Geoffroy, and to the two thus connected he gave the name *Frontatus*. Cuvier soon, however, discovered, from

* P. 156. † Règne Animal, 1817, 378.

some specimens transmitted to him by M. Van Breda, a relative of the illustrious Camper, that these two were quite distinct; that the Rostratus of Shaw was the Gangeticus, and that the Frontatus, M. Geoffroy's specimen, had the dorsal fin of the same species.* In 1828, Mr Lesson gave an accurate account of Van Breda's specimen under the name of *Delphinorhyncus Bredanensis*, a name quite appropriate and unobjectionable. Next year, however, (loc. cit.) Cuvier refers to this species under the appellation of the *Rostratus*, which, according to another statement, in the same page, is the Gangeticus: he also distinctly places it among the Delphinorhynci. Again, our author, in 1833, states that his brother had named this new species Rostratus, referring in proof to the Oss. Fos. v. 400, where we find that no such name was given to it: at the same time he applies a new trivial name to it, *D. à long bec.* In the work before us he changes his ground, and adduces as proof that the Baron had named the species Rostratus, in the Règne Animal, 1817, where the Rostratus of Shawalone is named. Finally, our author, who in 1833 had followed his brother, and had taken pains to show that this was a Delphinorhyncus,—"le museau de cet espèce montre assez quelle appartient à la division qu'on a plus particulierement designée Delphinorhynque,"—three years afterwards, in the work before us, excludes it from this genus, and ranks it as a Delphinus. It is assuredly not a little grievous, that when the great Cuvier could say of this very species, "Ces indications serve à mettre les naturalists à la torture," M. Frederic should now be acting in a way so truly extraordinary, for it is not easy to regard his entangled web as the result of mere carelessness or accident.

The fossils of this order of Mammalia have an interest peculiarly their own. To find not quadrupeds—the congeners of those which now tread upon the soil, but the mighty monarchs of the deep, in the centre of immense continents, and on the slopes of lofty hills, cannot fail to excite the most profound reflections. This, along with the fact, that Cuvier has devoted to them a most painful and successful investigation, has conferred on them an interest of the highest character; and hence we are not surprised to find that these fossils receive a prominent place in almost every history of the order which has appeared. From the work before us, however, they are excluded; and our author in a few words of the introduction advertises us of this peculiarity, remarking, that he has always considered these organic remains as the proper subject of a distinct branch of science. On several grounds we consider this as matter of regret. Were the treatise entirely popular, still we think that a passing notice of these

* Règne Animal, 1829, 289.

species would only increase its popularity. This is true of the other orders of the animal series. The fossil elk, the great mammoth, the extinct rhinoceros, the cave-bear, and many others which might be mentioned, are not the least interesting species of their respective genera, and are most attractive objects of natural history as beings of a bygone age, not one of which could be distinguished except by a most minute comparison with the living species. And surely, therefore, in a work like the present, which is altogether of a scientific cast, it seems a pity that they should be wholly neglected; the more so, as the science of geology must always turn to the zoologist for all the information it desiderates concerning this interesting department of its fascinating inquiries.

We now proceed to lay before our readers whatever appears most new and interesting in the work before us.

The preliminary discourse, extending to fifty pages, is composed of a general survey of the order, and dwells more especially on the peculiarities of their comparative anatomy. Here our author is minute and lucid, describing the internal as well as the external structure. One of the most interesting statements relates to a peculiarity of the arterial system, which is connected with the function of respiration. It consists in an innumerable congeries,—a vast plexus of great arteries, which, after respiration, is filled with highly purified blood, and which is lodged beneath the pleuræ, between the ribs, and on each side of the spine. The vessels forming this plexus rise from the upper intercostals, and they penetrate into the vertebral canal, and even into the cranium, by the occipital foramen. The plexus is not formed of ramifications which anastomose with each other, for they may in some degree be followed out, and unravelled as if they were only a single vessel twisted a thousand times upon itself. In addition to their connection with the intercostals, they are also connected with the vertebrals and carotids. They do not appear to communicate directly with any vein. The vena azygos is not situated anteriorly to the spinal cord, but is replaced by a considerable trunk on each side and posteriorly to the cord, which receives the intercostal and lumbar veins, and joins the superior *venu cava*. It is conceived that this singular structure is connected with the occasional long-continued suspension of respiration in the Cetacea; extending to the long period of an hour, and sometimes even more. These vessels, it will be seen, become a reservoir of highly arterialized blood, which entering gradually into the circulation will, for a long period, maintain life.*

* See p. xvii. 90.

No distinct mention is made of the source whence the information concerning this very peculiar structure has been derived. But J. Hunter accurately described it in his paper in the Phil. Trans.; and Dr Barclay pointed it out many years ago as surrounding the spinal cord of the Beluga.* Neither of these gentlemen, however, ventured to assign a use to it. M. Breschet published some remarks concerning it in the Mem. de l'Acad. des Sciences for 1834: this volume we have not been able to procure; but we learn,—though not from the work before us,—that to him belongs the merit of associating this very peculiar structure, with the no less extraordinary anomaly in the function of breathing, in this Order. Our author introduces the subject both when treating of the smaller Cetacea generally, and also in his preliminary discourse, whence we are led to infer that this remarkable piece of anatomy is not peculiar to the smaller, but occurs also among the largest genera.

Another statement, new to us, and also introduced without any reference to other authority, relates to the functions of respiration, and the anatomy of the lungs. It is in these words: "It is said that the (dauphins) smaller Cetacea have the lungs surrounded with muscular fibres, which contract both in the act of inspiration and expiration; and that the tubes so communicate with each other, that by inflating one you inflate all." In the latter part of this announcement, we recognize an observation which was made long ago by Mr J. Hunter, and therefore we have no doubt of its accuracy. The former part of the statement, on the other hand, we do not remember to have previously met with; and, if true, it would bear more ample details than have here been bestowed upon it.

A third interesting observation respects the skin, and rests upon the investigations of MM. Breschet and Roussel. According to these able anatomists, there may be discovered in the skin of the Cetacea, as well as of other Mammalia, six principal parts which rest on or penetrate into it, but which have all special and distinct functions to perform. These are, *first*, the *derme* or *true-skin*, a dense, fibrous, cellular canvas or net-work, which contains and protects all the rest. In the whales it is always white and opaque, and its superior surface exhibits a set of papillæ, the intervals of which are filled with a horny tissue—the epidermis. There is, 2*dly*, the *papillæ* just alluded to, which in the whale are several lines long, and are of a pearly colour; they are composed of fibres coming from and returning to the subcutaneous nervous plexi; and among them the blood-vessels freely penetrate. 3*dly*, There are the *exhalents* or

* Wern. Mem. iii.

perspiring apparatus, consisting of soft, elastic, spiral canals extending across the cutis, and having at their mouths a small epidermic valve, which is usually shut. 4*thly*, The *inhalents* or absorbing vessels, are extremely fine, smooth, branched, and easily torn, anastomosing with each other, and forming a net-work in the skin, underneath the papillæ; they have valves. 5*thly*, There is the *blennogène apparatus*, composed of secretory glands and excretory canals, which open among the papillæ, situated on the true skin, and produce a mucous matter which, in drying, becomes the epidermis; and, 6*thly*, there is the *colouring apparatus*, also composed of secreting glands and excreting canals, and situated in the upper layers of the skin. This is assuredly a far more detailed account of the various parts of that wonderful covering the skin, than any we have yet happened to meet; and appears to be alike minute and accurate.

Leaving these introductory details, our author proceeds to the herbivorous Cetacea, to which he devotes seventy pages, containing much valuable information. Nothing, however, occurs as peculiarly requiring our notice, except some statements regarding the Stellerus of Cuvier, concerning which we have a translation of the whole of Steller's accurate memoir in the Novæ Commentariæ Petropololit. As this work is not easily procured we regard this as a very valuable gift. Copious extracts from the memoir are to be found in Buffon and others of our more common books, but the whole will amply repay a careful perusal. We shall here specify only two particulars; and the structure of the heart shall be the first. Many of our readers may remember that an interesting account and drawing of the heart of the Dugong were given by the late Sir E. Home in one of the volumes of the Philosophical Transactions some fifteen years ago. In this paper he states that the peculiarity seen in its heart is not to be met with in any other animal. From Steller's account, however, we learn that it occurs also in the animal which is now known by his name; thus showing a curious correspondence in these two genera of the herbivorous Cetacea. The heart, says Steller, does not taper from the base to the apex, there to terminate in a single point, but it terminates in two distinct and separate apices, corresponding to the two ventricles: the separation reaches to about one-third of their extent, at which place they unite, and there resemble the usual appearance exhibited by the organ.

The other particular we shall advert to regards the mouth and the masticating apparatus. It would appear that both lips are double, that is, that there are first external and then internal lips. When the jaws approximate, the void space they circumscribe is

filled up by a band of strong white bristles, somewhat like pigeon's quills, which acting like a sieve, hinder the escape of the food when the water is discharged from the mouth. The masticating apparatus is quite peculiar. It is composed not of teeth, of which this animal has none, but of two large white bones or dental masses, of which the one adheres to the palate, and the other, its opposite, to the lower jaw. Even the insertion of these bones is peculiar, for it is not into the maxillaries, but they adhere by numerous pores and tubercles corresponding to others respectively on the palate and lower jaw.* Our interest in this curious structure is still farther heightened by the details of a minute examination by Mr Brandt, of certain specimens preserved in the museum of St Petersburgh. He ascertained that they were wholly horny, and composed of fibres agglutinated to one another like the baleen of the whale, and that these fibres, when examined by the microscope, are found to be composed of tubes, as is also ascertained to be the case with a great number of hairs.† Plate 7, *a*, affords a correct representation of these appearances. (This structure associates the Stellerus both with the great whales) and the Dugong; of which latter Dr Knox remarks, an extremely firm horny-looking substance seems to supply the place of the incisive teeth. It encrusts that remarkable portion of the upper jaw which, together with a corresponding and opposite one in the lower jaw, similarly encrusted, forms an extraordinary feature in the face of the Dugong."‡

In the discourse concerning the lesser Cetacea generally, there is an account of the osteology of the cranium of the *Micropterus* of Cuvier, which has not previously been published; and which, with the accompanying plate, gives an accurate idea of this part of its anatomy. Our author, in this place also, gives a rapid sketch of the anatomical structure of the group, concerning which there is little to call for observation; if it be not the oracular manner in which he determines the question now agitated regarding the functions of the blowing canal, and the *spoutings* of these animals. The point is discussed and dismissed in these words, "quoique quelques auteurs aient pensé le contraire, il parait certain que les narines des dauphins offrent un passage à l'eau que ces animaux puivent avoir besoin de faire sortir de leur arrière bouche: les attestations d'une multitude d'observateurs mettent ce fait hors de doubte."§ What will Mr Scoresby and Blainville say to this? A few details are collected concerning the size of the brain; but whether in one or more species we are not informed, and a very firm stand is thereupon made

* See p. 48. † See p. 376. ‡ Edin. Jour. of Science, i. 157. § P. 83.

for their intelligence and amiability. M. F. Cuvier seems disposed to dispute the opinion given in the Règne Animal, that they are the most carnivorous and cruel of the order;* and accordingly, he would exclude from the crowd of fictions which have been framed, the account given by Pliny of that kind dolphin which daily transported his youthful friend to school, and of that other, which used to be the companion and play-fellow of the bathers in the present Gulf of St Euphemia on the coast of Naples; and, thirdly, Pliny's additional statement, that the fishermen were in the habit of employing dolphins to assist them in their labours, and then rewarded them for their trouble; he thinks they may contract familiarity with man, may recognize his voice, and obey him.† We have no doubt that several, perhaps the majority, of the lesser whales are acute and sagacious animals. The ancients very generally made this statement, and probably had good grounds for doing so; but we cannot suppose that such an exposition of Pliny's statements as the above, will be regarded as very satisfactory by most of our readers.

In descending to the species of this subdivision, we find that M. Cuvier has 3 *Delphinorhynci*, 16 *Dolphins*, properly so called, 1 *Inia*, 7 *Phocænæ*, and 27 Dolphins, (we use his language), whose existence and characters are not yet satisfactorily ascertained; then succeed the *Narwhal*, *Hyperoodon*, and *Plantanista* genera, each containing one species. Recognizing, for the moment, the arrangement indicated above, we may state concerning the dolphins, that there is a notice of a new species not generally known in this country, and which we have not seen in any other systematic work. Our author calls it the *Ceruleo-albus*. Its characters are very slightly touched upon. The snout is said to be more covered and compressed than in the common dolphin, and its fins more pointed; seen from above it is wholly of a deep steel-blue colour; the under parts are of a pure and brilliant white, variously marked with black. It frequents the eastern shores of South America. This account is taken from the Nov. Acta Nat. Cuv. T. xvi.

Another animal which is here for the first time introduced into a systematic work is the *Inias*, a very curious variety lately described by M. D'Orbigny, (Nouv. Ann. des Mus. T. iii.) In the work now under review, it is placed somewhat inaccurately between the dolphins and phocænæ or porpoises, in as much as M. D'Orbigny remarks that it forms a link between the Platanista and the Stellerus. The learned naturalist encountered this animal in (High Peru) Bolivia, in a tributary of the Amazons, 2100 miles from the sea; and in this locality it abounds, and is fished for its oil. *Inia* is a

* P. 287. † P. 99.

name adopted from the natives. Its body is shorter and stouter than that of many of the smaller Cetacea; its snout is in the form of a long and very slender beak, almost cylindrical, and obtuse at its extremity. It has about 134 teeth; incisors in front, and molars curiously fashioned behind, where their summits are of an irregular mammillary shape: the auditory opening is conspicuous; the blowing canal runs obliquely from before backwards, and opens nearly over the pectorals. The swimming paws are large, bulky, and obtuse at their extremities; the dorsal starts two-thirds down the back, and has more the appearance of a low ridge than a fin; the tail is large: total length about 12 feet. The colour varies, and is generally a pale blue above, passing into a rose-colour beneath. This species appears to be an inhabitant solely of the rivers, and neighbouring fresh water lakes, far up the Amazons. It associates in small troops, lives wholly on fish, and seems to come more frequently to the surface to respire, and sometimes to masticate its prey, than the salt water species. It manifests the usual strong parental affection of the order.

To M. D'Orbigny we are also indebted for a more accurate account of the *Griseus* of Cuvier, than any we have hitherto met with. Our author assigns to it the name of this enterprizing traveller, which, however, we must deprecate, as being likely to lead to confusion. M. D'Orbigny had an opportunity of examining four grown individuals of the species, which were stranded on the coast of *La Vendee*, so that all doubt is now removed concerning its long doubtful characters. M. Cuvier has favoured us with a very fair representation of this and the last named animal, the Inia. This he has likewise done with regard to the beautiful Globiceps of Risso, taken from a specimen stranded near Nice in 1829, and communicated to our author by M. Lauvillard. This gentleman mentions a trait in the habits of this species which we do not remember to have before heard of in regard to any other. It was in the month of June that a troop of them approached the shore, in the Bay of St Jean. It was then observed that they often placed themselves in a vertical position, head downwards, with the tail and the posterior third of the body projecting from the water, and continued in this position for ten or fifteen minutes at a time; they appeared as if observing what was passing at the bottom of the sea, and were probably watching for their prey. It is also mentioned, that the colour of the sexes differs, the ground-work of the males being bluish-white, and that of the females a uniform brown.

But our space warns us that we must be drawing to a close, and we the less regret this, as we have but few observations to make on

the remaining pages of the volume. The author's description of the Chachalot—the Physeteræ or sperm whale, is imperfect, as it could scarcely fail to be; and more especially as Mr Beale's valuable pamphlet had not reached his hand till after his treatise had well nigh passed through the press. Like the Baron our author reduces the alleged species to one only, the *Macrocephalus*.

M. Cuvier numbers only three species under the genus *Rorqual*, established by his brother; these are the Jubbarte, the Mediterranean, and Cape of Good Hope species, thus inaccurately rejecting the *Rostratus* of Fabricius. In his plate of the first of these, which, to all appearance, is an exact copy of Lacépède's *Museau pointu*, he represents a great pouch projecting from under the tongue; and in the introductory discourse, after inquiring what is the nature of this sac, he answers, that it still remains to be ascertained. He adds, that some have supposed it to be connected with the respiratory apparatus, and others have viewed it as a swimming vessel, and, dissatisfied with these suppositions, suggests it may probably be the stomach distended after death by gas. But why the stomach? As every one knows there is much loose cellular membrane in this part of the body; and it is equally notorious that the whole of this tissue has the greatest liability to very rapid distension: this sac has only in one instance, we believe, been seen in the living, but very often in the dead animal; and we confess that this fact suggests an explanation which is alike simple and satisfactory.—We are also told, in the words of Van Breda, that the use of furrows under the lower jaw and throat is also unknown. So long as the animal is observed out of its native element we can easily believe that no satisfactory idea could be formed of its use; but when seen in water, and when it is there observed, that these furrows open out, and so produce an immense hollow bag or sac, thus supplying to the lower jaw of the Rorqual, that space which the Mysticetus, from its different shape, enjoys in the upper, then, we apprehend, that no difficulty should remain. If we remember right, M. J. Hunter, after examining the parts in the dead animal, was led to believe that these folds had no peculiar pliability, and that they could never relax and open out in the manner we have just mentioned: but, we know it is not less true that, having been examined in water, the augmented capacity of the mouth thus produced by this structure has been ascertained to be a fact, and its use thus demonstrated beyond a doubt.

In our author's account of the Greenland whale he repeats the old tale, that it reaches the length of 80, and even it is said, of 100 feet.* In a note he tells us that this is contrary to Mr Scoresby's

* P. 365

opinion ; but meets this statement by the query, Does not the great destruction of these animals prevent them from attaining their full size? We apprehend Mr Scoresby's most satisfactory answer should have superseded the necessity of this inquiry. *

Upon the whole, this volume will be found a very extensive and therefore valuable repository of facts and opinions concerning the Cetacea, somewhat hurriedly, we apprehend, and withal confusedly thrown together ; a particular prominency being at the same time given to the scientific—it would often be more appropriately called the unscientific—history of the several species. The work, moreover, embodies several valuable memoirs which are not of easy attainment. Among these the most valuable are Steller's account of the Rytina, already dwelt upon. There is also the fullest account of the Beluga, we know of, given in the words of the learned Pallas, which is original, and truly valuable from the opportunities that illustrious individual enjoyed of investigating its habits and structure : it is taken from his Zoographia Rosso-Asiatica. We may also mention an interesting memoir of Van Breda's upon the skeleton of the great Rorqual brought into Ostend in 1827, and measuring 95 feet ; and another, by Mr Campanyo, concerning the anatomy of the Mediterranean Rorqual, as seen in an animal 80 feet long, which was stranded at the foot of the Eastern Pyrenees in 1828. The skeleton of the former of these has been an object of interest first in Paris, and now in the United States, and that of the latter was last year exhibited in Lyons. Read with caution, this volume will prove valuable to the student, and will be found useful by the man of science.

II.—*A Monograph of the Family Ramphastidæ.* By J. Gould, F. L. S. Three parts, folio. 1833–36. London.

The ornithological works of Mr Gould have now reached to such an extent, and the illustrations are conducted with so much care, that they have become important as a series of correct and faithfully coloured figures. In 1830 a valuable collection of birds was received from the region of the Himalayas, containing several new forms, and many of the splendid species which were known only from collections of Indian drawings, or by the descriptions in Latham's general history, drawn up chiefly from these works of eastern artists. It was deemed advisable to publish a selection of these specimens, and under the auspices of the Zoological Society, his first work, "The Century of Birds from the Himalaya Mountains," appeared; a

* See Edin. Phil. Journ. Vol. i.

hundred species represented on eighty plates, accompanied with short descriptions by N. A. Vigors, Esq. Success in this work, and the wishes of several friends, induced Mr Gould to undertake another of greater magnitude, and requiring more labour to collect the species and information regarding them, "The Birds of Europe." The first seventeen numbers of this "ouvrage de luxe" have appeared; it continues with regularity, and many of the continental ornithologists are lending their aid to procure the rarer European birds, and to render the undertaking complete, and when it approaches the conclusion we shall devote a few pages to its examination.

Nearly at the same time with this last mentioned work, Mr Gould published the first part of his "Monograph of the Ramphastidæ," and about twelve months after, the commencement of a similar history of the "*Trogonidæ*." The last has reached its second number, and is a work of illustrations exquisitely finished; the former is completed in three parts, and contains figures of all the species which are known to ornithologists at the present time. The size of all these works is folio, the plates are entirely lithographic, drawn mostly by Mrs Gould, and at times when the press of matter is too great, by Mr Lear. With few exceptions, they are figures of great beauty, are delineated with correctness, and, as illustrated works in ornithology, they will perhaps stand at the head of any that are now in progress. We shall now examine in more detail that which we have noted at the head of this article.

The *Ramphastidæ*, taken as a family among the Scansores, will contain several more forms than those to which Mr Gould has devoted his present monograph, which might with more propriety be entitled an account of the Linnæan genus Ramphastos. It is confined to the illustration of *Ramphastos*, as now restricted by ornithologists, and to *Pteroglossus*, as separated from it by Illiger. These birds, though of clumsy and inelegant form, presented many enticing points for the monographist. They were yet known to inhabit only the forests of tropical America, almost unexplored, except upon the coast or the margins of some of the great rivers, and extremely difficult of access. Except in the works of Azara, and previous to the expeditions of the German naturalists to the Brazils, little was known of their manners, farther than that they frequented the deepest and most secluded thickets, their habits were only seen by the native hunters who had been dispatched on an errand which might have proved fatal to the European, and the dried spoils only reached the collections of this country. A great similarity in the colours of the

plumage, varying in many instances only by a difference in the distribution of the markings, required much discrimination to distinguish what had been esteemed species; and the brilliant colours of the bill, equally varied, and as closely allied in their distribution, and fading immediately after death, rendered accurate and carefully coloured plates the only way to preserve a similitude of the original tints. Our illustrations were contained in the works of Vaillant and Vieillot, both not easily procured, or they were to be found among the scattered plates of other ornithologists. Wagler,* in 1827, published the first part of his Systema Avium, describing twelve species of *Ramphastos* and fourteen *Pteroglossi*, and in general his descriptions are characterized by great correctness. They are the latest, and were looked upon as the best and most authentic. In the monograph before us, some of that naturalist's species are made synonymous with those of the older writers, and with Mr Gould's figures, while one or two are left apparently unaccounted for. This it will now be our endeavour as far as possible to point out, and we suspect that ere long another fasciculus will be required for the representation of additional birds.

In the true Toucans (*Ramphastos,*) the colours of the plumage are invariably black, white, red, or yellow, the throat and upper part of the breast, the rump and under tail coverts exhibiting the latter colours, while the body, wings, and tail are always dark. Ornithologists have taken their divisions from these; Wagler makes two, with the breast *white*, or with the breast *yellow;* Mr Gould separates them into four, A. B. C. D., combining with the colours of the breast those of the tail and coverts; but in a group so limited, the first is perhaps sufficient for every artificial purpose, and his third division C, is only characterized by a species, which is confessedly intermediate between it and the fourth or D. In the first four species of the monograph we see a great alliance in colour; they are all white, or nearly white-breasted, banded beneath narrowly with red, and the distinguishing marks are seen on the rump and tail coverts by yellow or red, and in the form and colour of the bill. *R. culminatus, Gould,* is given as undescribed; it has nothing near it in Wagler, except R. *Cuvierii, Wagl.* but seems at once distinguished from it, by the great size of the bill, its more gradual bend, and different form. *R. citreopigeus,* Gould, from the collection of Mr Swainson, seems a well

* This excellent ornithologist met with an untimely death in 1833, while on a shooting excursion near Munich: his gun exploded with fatal effect, while he was in the act of passing through a hedge.—*Gould's Monograph.*

marked species, distinguished by the lemon colour of the rump, and the entirely black bill banded with blue at the base; *R. erythrorhynchus* is known by the brilliant colour of its beak. Under this bird Wagler's *R. Levaillantii* is placed, perhaps correctly. The latter writer describes the bill of *erythrorhynchus* as "obscurè purpurea-rubra" of "Levaillantii," as læte aurantia; in the figure it is brilliant crimson, and we can easily reconcile the above descriptions to the fading colours of dried skins; a slight difference in size is the only other distinction pointed out. *R. osculans, Gould,* from the Vienna collection, is new, distinguished from the last by its yellow breast, and from *R. vitellinus* by its differently coloured bill and yellow rump. *R. toco* is a well known bird, but not very commonly brought to this country. *R. carinatus* is also well-marked. *R. Swainsonii, Gould,* has *R. ambiguus* of Sw. Zool. Illustr. given as a synonym with a? but if the lower figure be compared, there can be little doubt of their identity, the difference of marking in the bill, being very slight, is all that is mentioned as separating them. *R. dicolorus* we have always considered a well-marked bird, and one of the most common in Brazil, and the *R. tucai*, Wag., which Mr Gould places as a synonym, had not been seen by Wagler when he made his descriptions. The remaining two figures of our author, *R. vitellinus* and *Ariel,* Vigors, are very closely allied, and among their synonymy is unnecessarily entangled, that of the true R. tucanus of Linn. This bird is not known at all to present ornithologists. By Linnæus it is described "crisso uropygioque flavis," and we can see no reason to doubt the existence of a species with such a distribution of colours, particularly as we see so much alliance among the others. We should be inclined, therefore, to strike out *tucanus* altogether as a synonym to these birds, and either retain the species on the authority of Linnæus, or place it in the list of nominal ones until a specimen occurs. *R. callorhinchus*, Wagl. seems unnoticed in the monograph.

The *Pteroglossi* of Illig. exhibiting nearly an equal disproportion of bill, are marked by a greater variation of tints, and the tail is longer and cuneated; green is the prevailing colour in these birds; red and yellow still continue to mark the lower parts, the rump and crissum, but they are not distributed with so much regularity, and sometimes occur in large patches; white is wanting entirely. Wagler describes twelve species, all which are figured by Gould, with the exception of *P. Aldrovandi,* a bird which has got into our systems and histories, but for which we do not seem to have any good authority at the present day. To these eleven, another eleven spe-

cies, which appear to be all well marked, are added,—a very large increase within a few years to a group so limited.

P. aracari is well known. The immature plumage of the bird is also represented, and shows a much less development of the bill, and a total want of the deep black which marks the culmen and the whole under mandible of the adult. From this bird Lichtenstein has separated one of the varieties of Latham, &c. under the name of *P. regalis*, distinguished by a different marking of the bill and a different distribution of the colours. *P. castanotis* differs also by the colours of the bill, and from *P. bitorquatus* by this also, and by the greater proportion of red which occurs on the under parts of the latter; *P. Azaræ* is also of allied colours, but such distinctions can scarcely be pointed out except upon the specimen or in an accurate figure. The most remarkable bird in the whole work is that which occurs next, *P. ulocomus*, Gould. The head and back part of the neck are covered with feathers of a whalebone-like consistence, flat glossy black, curled at their tips, and resembling in their consistency what we see on the neck of Gallus Soneratii, or one or two species of the Ibis. It has also another peculiarity in the rich vinous tint which covers the mantle or back, not seen in any other species. *P. hipoglaucus* is nearly of equal interest; it is said to be from the most elevated part of the Andes, and is remarkable for its vividly coloured bill and the bluish grey tint which entirely covers the lower parts, combined with a yellow rump and crimson lower tail coverts. *P. inscriptus; Swain.*, and *Humboldtii, Wagl.* come in here, singular from the irregular markings on the bill. *P. Baillonii, Wag.* (Aracari, Baillon, Vaill. Pt. croceus, Jard. and Selby,) is remarkable for the nearly uniform greenish saffron tint of the whole plumage. The rump is red, but it is an exception to the general colour of the group. *P. culik, Wag.* and *P. maculirostris, Lichten. and the Monograph*, are allied in form, the males in colour, but easily distinguished by the spotted bill of the latter. *P. maculatus* (taken from the same marks on the bill) was the original name for this rare bird, but changed by moderns to *maculirostris*, perhaps without much necessity. To the first of these birds is also closely allied *P. Reinwardtii*, Wag. but it is considered distinct. The bill is somewhat intermediate between the two last, but an abdominal band of yellow marks their separation. *P. Natterii, Gould*, also of the same form, and coming near to maculirostris, is more decidedly marked than the last. *P. Langsdorfii* allied to *Reinwardtii*, but differing in the colours of the bill. These five birds, varying in form from the lengthened and more graceful *aracari*, might, to the minute di-

viding systematist, form a small group, characterized by smaller size, but thicker and more robust make, a very general similarity of plumage both in marking and distribution, a bill of moderate size, and often marked with blotches of dark colour. In the same manner might be separated the next birds, which indeed has been done by our author under the title of *Aulacorhinchus;* they exhibit plumage entirely of a grass green, and the size of the bill is not comparatively large, but in neither case do we now think this necessary. These birds of green plumage were formerly known only by *P. sulcatus, Swain.* from specimens in the collection of Earl Derby, but they have been increased by four in addition: *P. prasinus, Lichten. P. Derbianus pavoninus,* and *hæmatopigius,* Gould; the last, at once distinguished by a crimson rump, a variation of colour not seen in any of the others bearing this plumage.

In addition to the figures and descriptions of the birds there is an interesting essay on "the Anatomy of the Toucan" by Mr Owen, with a plate exhibiting the tongue and the feet, and a section of the bill.

Transactions and Periodicals—*British.*

The Entomological Magazine. London, January and April, 1836.

The January number commences with, 1st, Wanderings and Ponderings of an Insect-hunter, a discursive and affected paper.——2. A. H. Haliday, M. A. British species of the Dipterous Tribe *Sphæroceridæ.* In this paper, the arrangement and nomenclature of Macquart is adhered to, and thirty-eight species are described ——3. Portions of a letter from the author of the letters of Rusticus to Edward Newman. These extracts contain observations on certain species of Aphides, and on the *Blacks* or larvæ of the *Athalia centifoliæ,* so destructive to the young turnip plant.——4. Francis Walker on the species of *Teleas,* &c. ——5. J. V. Thompson, F. L. S. Deputy-Inspector of Hospitals. Of the double metamorphosis in *Macropodia phalangium* or Spider Crab, with proofs of the larvæ being Zoëa in *Gegarcinus hydrodomus, Thelphusa erythropus, Eripea Carribæa,* and *Graspus pelagicus,*—an interesting paper, but the proofs are scarcely so satisfactory or fully detailed as might be wished for.——6. Notes on various Insects, by Ionicus.——7. Henry Metford, M. R. C. S. on the origin of the Entozoa in the bodies of animals,—a paper of interest, in which the author endeavours to prove, that none of the hypotheses hitherto advanced can be supported, or are sufficient to account for the origin of these beings.——8. Francis Walker, Notes on the genus Aphis.——9. Varieties, among these: the capture of various insects is recorded, among them *Colias hyale* and *electra Deilephila galii, (Sphinx) convolvuli,* &c.

The contents of the April number are, 1. Travels through North and South Carolina, Georgia, &c. By William Bartram. Extracts.——2. Appendix to Captain Sir John Ross's Narrative of his second voyage. Extracts, with a catalogue of the

animals described by Captain J. C. Ross as natives of Boothia.——3. George Colgate on the Husk or Hoore in Cattle.——4. A. H. Haliday, M. A., An Epitome of the British genera in the order *Thysanoptera*, with indications of a few species.——5. J. V. Thompson, F. L. S. Deputy-Inspector of Hospitals. Natural History and Metamorphosis of an Anomalous Crustaceous parasite of *Carcinus mænas*, the *Sacculina carcini*. An interesting notice of an extraordinary parasitic animal, apparently " less perfect and more simple in its last stage than in that of its larva :" it is desirable, however, that the intermediate stages of the supposed larva should be more accurately traced.——6. Extracts of letters from C. Darwin, Esq. to Professor Henslow. From these extracts, much may be expected from the assiduity of Mr Darwin.——7. Notes on various insects by Ionicus. ——8. Francis Walker, Monographia Chalcididum, (continued from page 206.) ——9. G. R. Waterhouse, Curator to the Museum of the Royal Institution, Liverpool, A few observations on the habits of some species of Bees.——10. Edward Newman, Entomological Notes, (continued from Vol. ii. p. 516.)——11. Notes on the Cheese and Bacon-hoppers, and the Cheese Mite.——12. List of Entomological Works.——13. Varieties.

Transactions and Periodicals—*Foreign.*

Annales des Sciences Naturelles. Zoologie, MM. Audouin et Milne-Edwards. *Botanique,* MM. Ad. Brongniart et Guillemin. (From page 102.) Crochard and Co. Paris, Fevrier 1836.

1. *Zoology.*

Flourens' *Recherches sur les communications vasculaires entre la mère et le fœtus.* M. Flourens' experiments appear to prove, that there exists a vascular communication between the fœtus and the mother, and *e contra* a like communication between the mother and the fœtus, in all animals which have a single placenta ; while in animals, such as the sow, which have several placentæ, there is no vascular communication, and the connection between the mother and fœtus is one merely of contact. His experiments on ruminating animals, which have a peculiar confirmation of the placenta, were less decisive, but an attentive examination convinced him, that they were in this respect like the Pachydermata, or multi-placentular animals.——F. G. Pictet, *Mémoire sur le genre Sialis de Latreille, et Considérations sur la classification de l'ordre des Neuropteres,*—an interesting essay. The following is an outline of M. Pictet's classification of the Neuroptera.

Neuroptera.
- * *N. à demi-metamorphoses.*
- Termites. — Termites propr. — Termès.
- Termites. — Psocides — Psoques.
- Perlides — Perles.
- Perlides — Nemoures.
- Subulicornes. — Ephémérides — Ephémères.
- Subulicornes. — Libellulines — Libellules.
- Subulicornes. — Libellulines — Æshnes.
- Subulicornes. — Libellulines — Agrions.

- Neuroptera.
  - ** *N. à metamorphose complete.*
    - Planipennes. ...
      - Myrmél onides.....
        - Fourmilions.
        - Ascalaphes.
      - Hemerobius.....
        - Hémérobes.
        - Osmyles.
        - Nymphès.
        - Corydales.
        - Chauliodes.
        - Sialis.
        - Raphidies.
        - Mantispes ?
    - Panorpates.....
      - Nèmoptères.
      - Bittaques.
      - Panorpes.
      - Borées.
    - Phryganides.....
      - Phryganes.
      - Mystacides.
      - Trichostomes.
      - Sericostomes.
      - Phyacophiles.
      - Hydropsychés.
      - Psychomyies.
      - Hydroptiles.

Of *Sialis* two species are described—one of them for the first time, and illustrated by good figures. The larva is aquatic, but the pupa is terrestrial—an anomalous fact first observed by Roesel, and confirmed by Pictet. But, says Pictet, I have been much astonished to find, in spring, these larvæ at from six to eight feet from the water buried in a very dry earth, at the root of trees. They lived there with other terrestrial larvæ, and also with those of a Colymbetes, which appears to have the same habits. On finding these larvæ, not doubting but that they were true terrestrial species, I reared them in the earth. They lived at least fifteen days before their metamorphosis, and did not seem to have been injured. This fact, which is interesting as a trait in the economy of the genus, is important in the history of respiration. It is indeed the first instance of insects with external respiratory appendages breathing the atmosphere. The structure of these appendages is usually such, that they can fulfil their functions only when in a moist condition; if left dry they shrivel and become useless. I had reason, therefore to be astonished when I saw such larvæ live so long a time uninjured in a very dry soil.——Brandt, *Remarques sur les nerfs stomato-gastriques ou intestinaux* (nervus sympathicus seu nervi reproductorii,) *dans les animaux invertébrés.* A translation from the German of an elaborate memoir in the third volume of "Memoires de l'Académie Impériale des Sciences."——Poiseuille, *Recherches sur les causes du mouvement du sang dans les vaisseaux capillaries.*——Analyse *des travaux anatomiques, physiologiques et zoologiques presentés à l'Academie des Sciences pendant le mois de Fevrier* 1836. Of these notices we need specify the following only: Jacquemin's *Recherches sur le developpement des Mollusques.*——Peltier *sur les animaux microscopiques*— who denies the accuracy of Ehrenberg's observations on polygastric animalcules, and does not agree with Dujardin either,—affording a proof at least of the difficulty of microscopical inquiries in the ablest hands, and their great liability to deception.——Duvernoy, *Memoire sur quelques particularites des organes de la deglutition de la classe des oiseaux et des reptiles.*——Dumeril, *Observations sur les mouvemens de la langue chez les Caméleons.*

II.—*Botany.*

A continuation of Nees D'Esenbeck *et* Montagne's *Jungermanicarum species.*—A translation of D. Don's paper on the class of Personate plants in Edin. New Phil. Journ. for April 1835.——Koch's *Description des Orobanches de la Flora d'Allemagne.*——De Candolle *sur la decouverte du Thé dans une province de l'Inde Anglaise*: abstract of a paper published in the "Bibliotheque Universelle de Genevé" for June 1835. A society was some time ago formed at Calcutta to ascertain the possibility of cultivating tea in India, and the best locality for making the attempt. The province of Assam, which adjoins the Chinese empire, was thought of; and in answer to their inquiries, Captain Jenkins informed the Committee that the mountainous region lying between Cachan and Assam appeared to him to be extremely favourable to their purpose, and that indeed in the district of Beesa a kind of tea grew wild. This important notice having been confirmed, it remained to be ascertained if the wild plant had the delicious flavour of the Chinese: and if the province was really suitable either to its culture, or to the preparation of the leaves. De Candolle fears that the wild plant of Beesa will afford an inferior tea,—not that he denies the identity of the species with the true tea, but it may prove to be a variety with only a slight odorous property. We know that even in China the value of the tea varies much in different places: it is with the Thea as with the vine, which affords from even near localities a product very different in quality, and this need give us no surprise, for, besides diversity of soil and exposure, the shrub may be influenced by many differences in the period of the gathering of the leaves, in the number of these gatherings, in the preparation of the leaves, and perhaps also in the races or varieties which have been cultivated time immemorial in each locality. The wild Thea will probably give a stronger and more acrid savour, and a less delicate perfume. This consideration, however, does not lessen the interest of the discovery. If the province of Assam, which adjoins China, produces the Thea indigenous, it ought to be eminently suited to the culture of the shrub; and were the wild plant to be found an inferior object to the cultivator, the reclaimed race might be introduced advantageously from China. The Calcutta Society have acted wisely in sending Dr Wallich, with able assistants, to examine Assam; and in such hands there can be no doubt that what science, skill, and zeal can do in effecting the society's object, will be done. We cannot refuse ourselves the pleasure of giving a translation of the following letter from Dr Wallich to M. Benjamin Delessert, dated Calcutta 10th August 1835.

"I reckon on departing in four days—first for the mountains which adjoin the Sillet, particularly for Chuvra-Poonje and Myrung, where I shall sojurn until October. Crossing then the mountains of Khassea, I shall go directly to Gowahatty in Assam, and thence to Suddeya in Upper Assam, upon the river Berhampooter, where my investigations in relation to the tea will begin. I shall be accompanied by a physician whose name is well known to you as to MM. Mirbel and Brongniart—William Griffith—a young man skilled in general and physiological botany, and who cannot fail to acquire a high reputation. Another person attached to the medical service of the India Company is to accompany me in the quality of geologist,—it is Mr John MacCleland, who is now publishing a work on the geology of the province of Kamaon. I make it my boast that it was at my recommendation that these gentlemen have been attached to the mission.

" We hope to return in April of next year, by which time the principal object of the tour will be, I think, satisfactorily attained. This object is to make every possible research relative to the locality of the true Thea (wild and indigenous) in Upper Assam. I need not say that I reckon on making with Mr Griffith enormous collections of plants,—nor need I add that I desire especially to send you a good part. I shall address the whole to the Indian Company, but I will expressly demand that the duplicates be delivered to you, and I know too well the munificence of the Directors to doubt that my request will not be complied with. Government has been very liberal in the dispositions which it has made for our mission to Assam, both to myself and to my assistants. I shall take with me several artists and gardeners, and if I can display the same ardour and energy that I had in my first expeditions, I believe I shall obtain good results. I confess, however, that twenty-eight years sojourn in India has enfeebled me both in body and mind;—so that the best guarantee for my success rests on the inappreciable advantage of having such excellent fellow-travellers."

The other papers in this number of the Annales are copied from the " Flora," with the exception of the last, entitled *Animadversiones botanicæ nonnullæ novarumque aut non rite cognitarum plantarum diagnoses, auch. F. E. L. Fisher et C. A. Meyer.*

Archiv für Anatomie Physiologie und Wissenschaftliche Medicin, &c. Von Dr Johannes Müller. G. Eichler, Berlin, Heft i. 1836. 8vo.

The first article is by Dr Bischoff of Heidelberg, on the structure of the heart and circulation of the blood in Crocodiles.—The opinion and observations of several authors who have written on this subject, as Cuvier, Panizza, Goldfuss, Meckel, &c. are compared and commented on. Dr Bischoff seems to think that the opinions of Cuvier have not been fully borne out by more recent observations, and that the arterial system of these animals is more nearly allied to that of the Mammalia and Aves than was supposed the case by that great authority. We cannot be much surprised at the existence of discrepancies, when we recollect the obscurity in which the whole subject was involved, when the great professor commenced his labours, and when we consider the difficulty even now, of procuring the dissection of living adults of the greater part of the genus.

It appears that some differences in the internal structure of the species have already been observed, and we have no doubt that, as investigation is carried farther, that others will be found. In habits some of these creatures differ considerably from others. Crocodilus lucius, which is found in the Floridas and other southern provinces of the United States, passes the winter buried in the mud in a state of entire torpor, so that it may be cut in pieces without showing any signs of life. This habit is, we believe, unknown to the intertropical species, from the very obvious cause, that the equality of the high temperature they live in, does not require it.—Another species, the C. sclerops, which lives in the Maranon and Guiana, is subject, from the exiscation of marshy districts, in certain seasons to be left dry for considerable periods. The great gavial of the Ganges, C. longirostris, is entirely piscivorous and harmless to man, although it attains very large dimensions, whilst the common crocodile, which abounds in the same river, is extremely ferocious, and lives in a great measure on the bodies which

are floated down by the stream. We think it very probable, that, although there may not be any striking difference in their internal organization, that in some points their structure may be modified to suit the peculiar economy, and adapt them to the necessities of their existence. The C. Rhombifer, in its internal structure, bears some affinity to the Ophidians. In general the circulation is languid, and the volume of blood small in proportion to their dimensions. An illustrative plate of the heart of C. lucius is given.

The second article is from Dr C. T. Von Siebold of Dantzic, on the Spermal Ducts of Crustacea, Insects, Gasteropodes, &c. with two explanatory plates.

Dr Weber of Bonn contributes some very interesting observations on the hip-joint and the theory of motion of the human step.

Some notices on the anatomy of the windpipe of Anas leucocephalus and Ibis falcinellus, founded on observations made upon a set of preparations in spirit of wine brought from Sardinia by Mr Küster, with other remarks on comparative anatomy, are given by Professor Wagner of Erlangen.

The windpipe of a male of Anas leucocephalus was found to have a widening at the top, somewhat like that in Anas clangula, an inch and a-half long, below which the pipe is very narrow.

In Ibis falcinellus (the common Ibis,) the lower rings of the windpipe are very small, thin and rather round. They run close together, but are not joined. From the whole circumference of the last rings a strong membrane springs, which binds the two bronchials to the windpipe.

INTELLIGENCE.

ZOOLOGICAL INFORMATION.

Geographical distribution of the Chelones.—The Chelones are principally distributed in the warmer regions of the world, and near to the tropics, but they extend also to many portions of the temperate zones, reaching in the northern hemisphere to the 50° and beyond it, though in the southern they scarcely pass the 35° of S. latitude. It has been observed that the sea tortoises prefer the warmer climates, and some species are peculiar to certain parallels. The Chelonia imbricata delights in the intertropical seas, although it appears not to have been found either upon the coast of Africa or on the great Indian Ocean. The Ch. viridis, on the contrary, frequents all the seas of the torrid zone; but the Ch. cephalos, which is generally met with in the northern hemisphere, advancing to the 48°, is common in the western part of the world, while it is rare in the eastern, and appears only accidentally to frequent the coasts of countries situated beyond the equator. Spargis, again, may be considered cosmopolite, and is found either indigenously or accidentally in most of the seas frequented by the marine tortoises.

Of all countries, America produces the greatest number of the Chelones which are comprehended in the genus Emys, but this vast continent at the same time maintains only a single species of the genus Trionyx, confined apparently to the southern parts of the United States, while the only land tortoise of the new world Test. tabulata, extends from South Carolina over the greater part of intertropical America; we are ignorant, however, whether this species, common to many of the Antilles, has been originally indigenous to them, or has been imported. We might also presume this to be the case with the Indian tortoise, which is at this time distributed over the western coasts of N. and S. America from California to Chili, and we might even have suspected, that this large tortoise had been naturalized upon the Galapago isles of the Pacific, although at so great a distance from its true country if the early Spanish navigators had not met with it in abundance on these solitary and deserted islands. We have already remarked, that North America produced only one species of Trionyx, Tr. ferox, and that this country, on the contrary, is remarkably rich in species of the genus Emys. All the species agree, however, nearly with the last, or they may be considered as tortoises inhabiting equally the land or water. One of them, E. serpentina, spread over most of the provinces of the United States, is peculiarly aquatic in its habits, and evidently forms the passage to the genus Trionyx; another, on the contrary, E. clausa, common from Hudson's bay to the Floridas, approaches in its manners to the land tortoises, which it seems intended to ally to the genus it has been placed in from its own structure. Other species, as E. punctata and odorata, approach the manners of the land division, though in a less degree. They are common in the United States, but the first does not exist in the southern provinces, which the second inhabits, and has been found as far south as the river Alvarado, in Mexico. The other Emydes of North America are, E. picta, Müllenbergii and centrata, species more peculiar to the northern states, reaching even to Canada; also E. serrata, reticularia and geographica, which

have been taken in many situations far distant from each other. South America also produces anomalous Emydes, possessing an organization which enables them to live habitually in the water. E. chelys, a species very remarkable from the singular form of some of its parts, inhabits the marshes of Cayenne and the province of Para; E. platycephala, common throughout Brazil and Surinam, belongs to the long-necked section, a small group characterized by habits still more peculiarly aquatic. Following these Emydes may naturally be placed the E. expansa and Dumerilii, species of large size which inhabit the banks of the Maranon and its tributaries. Finally, the E. punctularia and scorpioides, common both in the same situations and in Guiana, and differing from the preceding, the one to approach the typical forms of the genus, the other to the E. odorata, which it replaces in Southern America, and of which it is even suspected to be a variety consequent to the difference of climate.

Africa presents to us in reference to the geographical distribution of the Chelones, phenomena entirely different from those which we observed in the new world. The barren plains of this immense peninsula give rise only to torrents whose waters, absorbed during summer in the moving sands, are exhausted and dried up by the influence of the tropical heats. It is to this that we must attribute the existence of that small number of fresh water species, compared with the very considerable amount of those spread over America, and it is also from this reason that Africa maintains so many terrestrial Chelones. A single Emys, E. galeata, from the group of the long-necked Emydes, inhabits the rivers of the Cape, and is found also in Senegal. It appears that the Nile wants them entirely, for this river maintains only a single species of Trionyx, distributed also over a great part of Africa which lies under the tropics. But this vast continent with its neighbouring islands produces seven different species of land tortoises, or rather the whole known species of the genus, with the exception of that from America. Three of these, Test. angulata, areolata, and geometrica, inhabit the vicinity of Cape Town, but they are at the same time found in Madagascar, and the first has been observed at Sierra Leone. The Testt. pardalis is found on the eastern part of the colony of the Cape; the Test. radiata at Madagascar, and perhaps also in Senegal and Abyssinia. The Test. Indica is now indigenous to Madagascar, and also on the neighbouring islets, though it has been exterminated from those on which Europeans have been established. The Test. Greca again is only found on the northern coast of Africa from the states of Barbary to Syria.

The same land tortoise (Test. Greca, the only European species,) frequents, in this part of the world, the well-watered countries of the Mediterranean, from the Morea to France. These parts produce an Emys, E. Europea, which inhabits also Germany and Prussia, and has been found upon the Wolga; but the second European species of the genus E. vulgaris has only been observed in Spain, in Dalmatia, on the Morea, and on the shores of the Caspian sea.

Asia is inhabited by a very considerable number of fresh water tortoises, but this vast extent of country only maintains a few species of land tortoises. We have already stated that the Test. Greca inhabits a part of Syria; the Test. geometrica, an African species, is found also in the island of Ceylon; but the existence of the Test. Indica in a natural state upon the coast of Coromandel, requires yet to be confirmed by more accurate observations. Of the six known species of Trionyx, no less than five inhabit the rivers of Southern Asia. One has been observed in the Euphrates, which is perhaps identical with the Trionyx

of the Nile, also found in Industan. The Ganges maintains a species, Tr. Gangeticus, peculiar, as far as it is known, to that river; another, the Tr. granosus, which forms the passage to the Emydes, is found also on the coast of Coromandel; while two others, Tr. stellatus and subplanus, have been observed from Bengal to the Island of Java. The Trionyx of Japan belongs most probably to the first of these, which would thus be nearly as widely diffused as the E. vulgaris, of which a local variety is found in the islands of that empire. The other Emydes of the south-eastern portion of Asia are E. tectum; E. megacephala, so characteristic in its heavy or unwieldy form; E. tetraonyx, intermediate between the Emydes and Trionyx, and a native of the river Irawaddy; E. Spengleri, of which several interesting varieties are known from the isle of France, Ceylon, Penang, Malacca, Sumatra, Java, Borneo, and China; and finally, two species, which vary from the others by their rounded shell, and of which one possesses a moveable sternum; E. couro inhabits China, the southern point of Celebs, and the islands of Penang, Java, and Amboyna; while the other, E. trijuga, has only been found in Java.

We are only acquainted with a single tortoise from New Holland, the E. longicollis, belonging to the group of long-necked Emydes.—*Siebold, Faun. Jap. Chelonii per C. J. Temminck, and H. Schlegel.*

Motacilla neglecta, Gould.—An adult male bird of this species was killed by Mr Hoy, in the parish of Stoke Maryland, Suffolk, on the 2d of May 1836. This we believe is the first authenticated British example of the grey-headed wagtail.

Tringa pectoralis, Buonap.—The same gentleman has also in his possession a specimen of the Pectoral Tringa, killed upon the borders of Breyden Broad, near Yarmouth. Upon dissection it proved a female. Mr Anderson, who examined the specimen, pronounced it to be the Tringa pectoralis of the United States.

Salmon, food of.—From the rare occurrence of being able to detect any thing recognizable in the stomach of the salmon (*S. salar*) on its first egress from the sea, it has by many been supposed to feed entirely upon animalcula or minute entomostraca, (according to Dr Knox upon the spawn of certain species of Asterias or star-fish.) The following fact, however, evidently shows that it is not always content with such minute prey, as indeed we had previously been satisfied in our own mind was the case, from the circumstance of its voracity in rivers, as well as in large estuaries, where it is frequently taken, by a sand-launce, used as a bait. "On Saturday, June 18, 1836, (my correspondent, G. C. Atkinson, Esq. informs me,) a female fish *S. salar* of twelve pounds weight, was taken at Tynemouth Bar, in the stomach of which were *thirteen* herring sprats; there was nothing remarkable in the external appearance of the fish, but the stomach was of large size, and has a diseased appearance." This probably arose from its great distension, but as the viscus has been preserved, we shall upon inspection be better able to judge whether this is the case or not. In corroboration of the predatory habits of the salmon, I may add, that Dr Johnston informed me a few days ago, that the stomach of a grisle (the young of S. salar,) of one and a-half pound weight, and one of the first taken this season in the Tweed,

upon dissection, contained a large herring sprat, recently swallowed, as appeared from the slight decomposition that had taken place.—P. J. S.

Woodcock breeding in Scotland.—Within late years it has been remarked that woodcocks remain and breed more frequently in Scotland, and in greater numbers than they used to do. We are informed by a gentleman who rents a shooting district in the north-west of Aberdeenshire, that this season there are several pairs breeding upon the property, though they were not known to do so a few years ago, and the same is the case in other districts, as in Strathmore, &c. What reason is to be assigned for this change in their habits? is it to be attributed to a change in our seasons, or are we to look for it in the great increase of woods or plantations so general over all the island, affording these birds additional and secure retreats, as well as an abundant and constant supply of food. —P. J. S.

Ammocœtes branchialis and Gasterosteus semiarmatus. Dr R. Parnell has taken specimens of both these fish in the Tweed near Berwick: the most northern *habitat* for them in Britain, which has been ascertained.—G. J.

Raniceps trifurcatus.—I picked up a specimen on the sands near Tynemouth, Northumberland, where it had been left by the tide. The fish was still alive, though, judging by the distance the sea had ebbed, it must have been out of its element for two hours.—*Albany Hancock*, May 26, 1836.—G. J.

Neritina fluviatilis, Paludina achatina, vivipara, and impura,—have lately been found in considerable numbers on the shores of the Forth, at St Davids in Fifeshire. As far as I am aware they have not hitherto been found in Scotland, and their occurrence in such a suspicious locality renders it probable that they were conveyed there in ballast, from which source the flora of the same neighbourhood has been enriched with several plants not indigenous to Britain. —*E. Forbes.*

Helix Scarburgensis.—This, the prettiest of all our native Helices, is found in one or two spots in the dean at Twizel-house, Northumberland. I have also found it, though very seldom, in Berwickshire.—G. J.

BOTANICAL INFORMATION.

Algæ Britannicæ.—Sir W. J. Hooker is preparing a "*Manual of the British Marine Algæ*," and will be thankful to receive specimens of new or rare species from any part of our coasts, as well as information respecting unpublished localities of the scarce kinds. The descriptions will be written entirely in English, and all unnecessary *technical* terms will be avoided.—*Comp. to Bot. Mag. for June* 1836.

Erica Mackaiana, Babington.—Many-branched cross-leaved heath. "Leaves four in a whorl, ovate, ciliated, smooth; flowers capitate, pedicelled; sepals ovate, ciliated; smooth; pedicels villous and downy; corolla oblongo-ovate; anthers awned, included; style exserted."—Bab. MSS.

On the declivity of a hill by the road side within three miles of Roundstone, Cunnamara, Mr W. M'Calla. Fl. July, Aug. Specimens of this presumed new

species were left for me in September 1835, by Mr Babington, and soon after I received others from the discoverer, when at first sight it struck me as being different from any species I was acquainted with. In its ovate, ciliated leaves, it much resembles E. ciliaris, while in its mode of flowering and awned anthers it agrees with E. Tetralix; it, however, differs from that species in its more shrubby habit and in the disposition of its branches, which, instead of having the flowering ramuli generally springing from one point (determinate ramosi) they are irregularly disposed and much crowded towards the top of the main branches. Dr Hooker, who has kindly sent me a figure of this, is not as yet decided in his opinion whether it will ultimately prove a distinct species from E. Tetralix. There is, however, I think, no doubt of its being at least a very distinct variety.—*Fl. Hibernica, J. T. Mackay.*

MISCELLANEOUS INFORMATION.

Questions de l'Académie Royale des Sciences de Berlin pour les concours des années 1837 *et* 1839.—1. Parmi les Vers soit d'eau douce soit d'eau marine soit intestinaux il en est plusieurs auxquels on ne sauroit encore assigner avec une précision suffisante leur place dans le système, parceque leur anatomie est ou bien entièrement ignorée ou imparfaitement connue. L'Académie demande l'anatomie exacte des formes aux quelles ces incertitudes s'appliquent le plus éminemment: parmi les Vers, *Gordius aquaticus* (ou telle autre espèce de *Gordius*), surtout s'il est possible *Nemertes Borlasii;* ici ce que l'on connoit déja de la structure de *Anguillula fluviatilis, Ehrenb.*, des Annelides, des Planaires et des Filaires pourra servir de point de comparaison. Quant aux Vers intestinaux l'Académie désire des renseignemens nouveaux sur *Pentastoma*, sur une espèce quelconque des Tenioides et des vers vesiculaires, et sur les Cercaires. Le but de ces recherches est d'arriver à une description anatomique du système digestif, de celui des organes de la génération, et des systèmes nerveux et vasculaire, ou du moins des parties de ces systèmes organiques dont il aura été possible d'avérer l'existence. En combinant ensuite les résultats de ces nouvelles recherches, avec les données anatomiques précedement connues on soumettra, à un examen critique les différentes positions assignées à ces Vers et à ces Intestinaux dans les systèmes zoologiques.

Le 31 Mars 1837 est le terme de rigueur pour la rentrée des Mémoires, qui doivent être anonymes et accompagnés d'une devise avec nom d'auteur sous cachet. L'attribution du prix de 50 ducats est fixée à la séance publique du 3 Juillet même année.

2.—*Prix fondé par legs pour une Question d'Economie Rurale.*—Parmi les végétaux d'une saveur douce il en est plusieurs qui contiennent le sucre en des proportions quelques fois assez ramarquables, ausi que Marggraf l'a déja prouvé pour la Bette rave, qui par les procédés appropriés à l'extraction du sucre est devenue dans plusieurs pais un produit très important de l'économie industrielle.—L'Académie désire que pour une grande majorité de plantes abondantes dans nos climats qui non point encore été soumises avec succès à un pareil examen, on applique les mêmes tentatives d'extraction soit à la plante entière soit á quelcune de ses parties. L'Académie demande en outre pour chaque plante une détermination précise de l'espèce de sucre qu'elle contient, soit de Cannes soit de Grappes soit de Manne soit de telle autre modification. Il est par conséquent nécessaire que les competiteurs joignent à leurs mémoires un échantillon du sucre extrait de chaque végétal, et cela en etat de crystallisation

s'il est de la nature du sucre de Cannes ; mais comme il est souvent très difficile en opérant sur de petites quantités de faire disparoitre entièrement les substances étrangères qui donnent au sucre une couleur brune, l'on n'exige pas que les échantillons soient d'une pureté et d'une blancheur parfaite.

Considérant l'étendue et la multiplicité des détails d'une pareille recherche la Classe fixe à quatre années la durée du concours et en double le prix.

Le 31 Mars 1839 est le terme de rigueur pour la rentrée des Mémoires, qui doivent être anonymes et accompagnées d'une devise avec nom d'auteur sous cachet. L'attribution du prix de 100 ducats est fixée à la séance publique du 3 Juillet même année.

State of Natural History in Newcastle-upon-Tyne.—It is only of late years that an institution has been established in Newcastle for the promotion of Natural History, yet previously there had not been wanting a few individuals who had devoted their attention to this branch of science with success. Among these may be mentioned the celebrated Bewick, whose histories of Quadrupeds and British Birds are too well known to need commendation here. But the attention of the Newcastle naturalists was until lately principally directed to the study of Botany. The result of a careful investigation of the Flora of the district was given to the public in 1805, in the form of a Botanist's Guide to the counties of Northumberland and Durham, by Messrs Winch, Thornhill, and Waugh. Mr Winch has since published several detached essays on botanical subjects.

The Literary and Philosophical Society of Newcastle, a valuable institution, founded upon a liberal basis, has now been in existence for upwards of forty years. This institution supports an extensive library, an annual course of lectures on literature, natural philosophy or natural history, and, according to the plan of its founders, a museum. This latter object, owing to the want of sufficient funds, and perhaps also to the lukewarmness of a majority of its members, remained for a number of years little more than a dead letter. In the year 1822, however, the society, on the recommendation of G. T. Fox, Esq. purchased the private museum of the late George Allan, Esq. of Blackwell Grange. This collection, celebrated in its day, was originally formed by Marmaduke Tunstall, Esq. of Wycliffe, and afforded many subjects for the works of Pennant, Latham, and Brown. Bewick also drew from specimens contained in it some of the rarer species of his "British Birds." The principal feature of this museum, in fact, was the fine collection of British birds, many of which have now suffered from the unsparing hand of time. It also contained a good collection of the South Sea curiosities brought to England by the celebrated Captain Cook. The history of the whole collection, with biographies of its former possessors, is minutely detailed in a volume published by Mr Fox, entitled a "Synopsis of the Newcastle Museum." The society first opened this museum to the public in a room of their new building in 1826, and appropriated a portion of their funds for its support. This was afterwards increased by a private subscription among the friends of natural history. But it was soon found that to support a museum at all adequate to the importance of the town and the increasing taste for the subject, required funds far beyond what the Literary and Philosophical Society could spare for the purpose. Under these circumstances a few of the friends of natural science in Newcastle undertook the establishment of a Natural History Society.

The project succeeded even beyond their most sanguine expectations ; and,

aided by several country gentlemen and coal-owners of the neighbourhood, the present "Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne" soon sprang into existence; the Duke of Northumberland consenting to accept the office of Patron, and the Bishop of Durham that of President. A proposal was made to the Literary and Philosophical Society to purchase their museum as the nucleus of the new collection, which being declined, the Natural History Society, unwilling to establish a museum in opposition to that of the old institution, after some little difficulties in the negociation, came to an agreement with the Literary and Philosophical Society to take charge of and arrange its collection along with that about to be formed, and in consideration of an annual payment to allow its members and their friends free access to the museum. The bond of union was still further cemented of the purchase by the Natural History Society of a piece of ground adjoining the other society's building, on which has been erected a handsome museum. This has been connected by a short gallery with the library of the Literary and Philosophical Society, the whole forming an elegant suite of rooms. The present museum, which was opened in December 1834, contains an excellent collection of British birds, embracing, with the rarities of the Allan Collection, a series of beautiful recent specimens, preserved by the curator, M. R. R. Wingate, in a very superior style, and with a minute attention to the anatomy and habits of the birds. Associated with these is a collection of their eggs. Of foreign birds there is a good and rapidly increasing collection. The Mammalia and fishes are not numerous, but among the latter are a few curious and rare species; and a noble specimen of the polar bear, admirably set up, is conspicuous among the former. It may be sufficient to say of the other departments of zoology that the collections are very respectable, particularly those of shells, insects, and corals. An entire room is appropriated to geology, and contains an excellent collection of fossils, in which the fossil plants of the coal formation hold a conspicuous place. A very fine collection of minerals, the property of Mr Hutton, is deposited in the museum for exhibition. Nearly the whole of the collections are now arranged according to the most approved modern systems—not forgetting, at the same time, such a disposition of the different parts as may make the whole agreeable to the eye of taste. It is to be regretted that there are as yet no specimens of comparative anatomy in this museum. This branch of study is becoming daily more important, on account of its use in the natural classification of animals. We hope, therefore, that some of the young students of anatomy connected with this town will endeavour to supply the deficiency.

The society has now been in existence six years, and consists of between two and three hundred members. It holds meetings monthly, excepting in the summer quarter, when there is a recess. From the papers read at these meetings two volumes of Transactions have been published.* As might be expected in a district of great mining importance, the principal part of the papers are geological. Many of these contain very valuable information connected with the operations of mining. The articles on Zoology and Botany are chiefly descriptive of local species. Among them are the following papers—On the Birds of Northumberland by P. J. Selby, Esq.—on the Zoophytes of Berwick Bay by Dr Johnston—on the land and fresh water Mollusca of the neighbourhood of Newcastle by Mr Alder,—and a Flora of Northumberland and Durham, by Mr Winch. In connection with this subject it may be permitted us to mention Lindley and Hut-

* A new volume is nearly ready for press.

ton's Fossil Flora of Great Britain; one of the authors of which is a secretary and active promoter of this society; many of the specimens figured in the work have been procured from the coal mines near Newcastle. British Oology is another work emanating from a member and late secretary of this society, Mr W. C. Hewitson, whose removal to a distant part of the country the society has lately had to regret.

It is worthy of remark, that the Natural History Society of Newcastle is not a company of shareholders, gaining an individual advantage by the increase of the museum. Each member retains an interest in the property of the society no longer than while he remains a subscriber. The subscription is one guinea per annum, without entrance fee; and the museum, while professedly open to members of both societies and their friends, is virtually so to all respectable persons, residents as well as strangers, without any charge for admission. The society has not hitherto suffered any diminution of its funds from pursuing this liberal course, and it is to be hoped that the public spirit of the inhabitants of Newcastle will enable it hereafter to continue the same plan; the object of the society being "to diffuse more generally a taste for those refined and rational pleasures to be derived from the study of the works of nature."—In conformity with this plan the museum has also been occasionally opened in an evening for the accommodation of the working-classes.

There are some good private collections in Newcastle, the most valuable of which is Mr Adamson's splendid cabinet of shells, the finest in the north of England. Mr John Hancock has an interesting museum of British birds and other vertebrated animals, beautifully preserved by himself. Mr George Wailes's extensive and valuable cabinet of British insects is well worth the attention of the entomologist; and Mr J. Alder has a very good collection of British shells. In botany Mr Winch's fine herbarium takes the lead, but those of Mr William Robertson and Mr R. B. Bowman also contain a very extensive series of British plants, to which the latter has in his late tour in Norway added many interesting plants from that country. Mr W. Hutton's collection of vegetable fossils is perhaps the finest extant. A few smaller collections might here be named, but enough has been said to indicate the state of natural history in this town, and to guide the scientific traveller to such objects as he may wish to investigate.

Fauna Japonica, Ph. Fr. D. Siebold.—The Crustacea under the superintendence of M. De Hann, in two Fasciculi, with uncoloured lithographic plates, and the Chelonii by C. J. Temminck and H. Schlegel, also with uncoloured lithographic plates, have just reached us, as all which has yet appeared of this very important work. M. De Hann has attempted to arrange the Crustacea upon the principles laid down by Mr Macleay, and will be found to contain some very interesting information. A more extended notice will be devoted to it.

NOTICES AND PROCEEDINGS OF SOCIETIES—LONDON.

Royal Society, January 14.—Dr Daubeny's paper, "On the action of Light upon Plants, and of Plants upon the Atmosphere," was concluded. This interesting paper was commenced at the concluding meeting of 1835. "The objects of the experimental inquiries of which the author gives an account in this paper were, in the first place, to ascertain the extent of the influence of solar light in causing the leaves of plants to emit oxygen gas, and to decompose carbonic acid, when the plants were either immersed in water, or surrounded by at-

mospheric air. The plants subjected to the former mode of trial were, Brassica oleracea, Salicornia herbacea, Fucus digitatus, Tussilago hybrida, Cochlearia armorica, Mentha viridis, Rheum rhaponticum, Allium ursinum, and several species of Gramineæ. Geraniums were the only plants subjected to experiment while surrounded with atmospheric air. Comparative trials were made of the action on these plants of various kinds of coloured light, transmitted through tinted glass, of which the relative calorific, illuminating, and chemical powers had been previously ascertained; and the results of all the experiments are recorded in tables; but no general conclusion is deduced from them by the author. He next describes a few experiments which he made on beans, with a view to ascertain the influence of light on the secretion of the green matter of the leaves, or rather to determine whether the change of colour in the chromule is to be ascribed to this agent. The third object of his inquiries was the source of the irritability of the Mimosa pudica, from which it appeared that light of a certain intensity is necessary for the maintenance of the healthy functions of this plant, and that when subjected to the action of the less luminous rays, notwithstanding their chemical influence, the plant lost its irritability quite as soon as when light was altogether excluded. He then examines the action of light in causing exhalation of moisture from the leaves; selecting Dahlias, Helianthi, Tree Mallows, &c. as the subjects of experiment. The general tendency of the results obtained in this series is to show that the exhalation is, cæteris paribus, most abundant in proportion to the intensity of the light received by the plant. He also made various comparative trials of the quantity of water absorbed, under different circumstances, by the roots of plants, and chiefly of the Helianthus annuus, Sagittaria sagittifolia, and the Vine. From the general tenor of the results of these and the preceding experiments, he is inclined to infer that both the exhalation and the absorption of moisture in plants, as far as they depend on the influence of light, are affected in the greatest degree by the most luminous rays; that all the functions of the vegetable economy which are owing to the presence of this agent, follow, in this respect, the same law; and that in the vegetable, as well as in the animal kingdom, light acts in the character of a specific stimulus. The author found that the most intense artificial light that he could obtain from incandescent lime produced no sensible effect on plants.

"The latter part of the paper is occupied by details of the experiments which the author made with a view to ascertain the action of plants upon the atmosphere, and more especially to determine the proportion that exists between the effects attributable to their action during the night and during the day; and also the proportion between the carbonic acid absorbed, and the oxygen evolved.

"His experiments appear to show that at least 18 per cent. of oxygen may be added to the air confined in a jar by the influence of a plant contained within it. He also infers that the stage of vegetable life at which the function of purifying the air ceases, is that in which leaves cease to exist. The author shows that this function is performed both in dicotyledonous and in monocotyledonous plants, in evergreens as well as in those that are deciduous, in terrestrial and in aquatic plants, in the green parts of esculents as well as in ordinary leaves, in Algæ and in Ferns as well as in Phanerogamous families. Professor Marcet has shown that it does not take place in Fungi.

Jan. 21—Sir David Brewster's paper, "On the Anatomical and Optical Structure of the Crystalline Lenses of animals." The author has examined the structure of the crystalline lens of the eye of a great variety of animals belonging to

each of the four classes of Vertebrata; and has communicated in this paper a detailed account of his observations, arranged according as they relate to structures more and more complex. In a former paper, published in the Philosophical Transactions for 1833, the lens of the Cod fish was taken as the type of the simplest of these structures, in as much as all the fibres of which it is composed converge, like the meridians of a globe, to two opposite points, or poles, of a spheroid or lenticular solid; both of which poles are situated in the axis of vision. The structure which ranks next in respect of simplicity is that exhibited in the Salmon, among fishes; in the Gecko, among reptiles; and in the Hare, among Mammalia. It presents at each pole two septa placed in one continuous line, in different points of which all the fibres proceeding from the one surface to the other have their origin and termination. A structure somewhat more complex is met with in the lenses of most of the Mammalia, and is particularly exemplified in the lion, the tiger, the horse, and the ox. Three septa occur at each pole in the form of diverging lines inclined to one another at angles of 120°. The next degree of complexity is presented in the lens of the whale, the seal, and the bear, which contain, instead of three, four septa on each side, placed at right angles to each other in the form of a cross. In some specimens of lenses of whales and seals the author observed two septa from each pole, forming one continuous line, from each of the extremities of which proceeded two others which were at right angles relatively to one another: so that there were in all five on each surface. The most complex structure is that of the lens of the elephant, which exhibits three primary septa diverging at equal angles from the pole, and at their extremities bifurcating into two additional septa, which are inclined to each other at angles of 60°, these latter being the real septa, to which the fibrous radiations are principally related. In some lenses of the elephant the author found the three septa immediately proceeding from the poles exceedingly short, and approaching to evanescence; so that he has no doubt that occasionally they may be found to have disappeared, and that the other six septa will then all diverge from the poles, like the radii of a hexagon, at angles of 60°.

February 4th.—"Memoir on the Metamorphoses in the Macroura, or long-tailed Crustacea, exemplified in the Prawn (Palæmon serratus.) By John V. Thompson, Esq., F. L. S., Deputy Inspector-General of Hospitals. Communicated by Sir James Macgrigor, M. D., F. R. S., &c.

"The author gives descriptions, illustrated by outline figures, of three different stages of growth of the Prawn; the first being that of the larva, immediately on its exclusion from the egg; the second, at a later period, when it has acquired an additional pair of cleft members, and a pair of scales on each side of the tail; and the third, at a still more advanced stage of developement, when it presents the general appearance of the adult Prawn, but still retains the natatory division of the members, now increased to six pair. The author thinks it probable that an intermediate stage of metamorphosis exists between the two last of these observed conditions of the animal."—*Lond. and Edin. Phil. Mag.*

Medico-Botanical Society, April 27, 1836.—W. T. Iliff, Esq. in the Chair. Mr Iliff presented specimens of the Ilex Paraguayansis, or Paraguay tea. The Ilex, according to the description given of it, is about the size of an orange tree, and has opposite, shining, oblong, serrated leaves. The flowers are in axillary umbels, and have four petals, and four stamens. The leaves, which are gathered for tea, are taken from plants of two or three years of age, or when the trunk is about an inch in diameter; they are very fragile when dry, and M. Virey says

the natives are suspected of breaking the leaves, so as to prevent a discovery of the plant from which they are obtained. The leaves of the Mati are prepared for making the tea in the following manner: A long cylindrical furnace is constructed, termed a barbagna, in which a bright fire is made with the dry branches, from which the leaves had previously been separated. When this furnace is sufficiently heated, the leaves are spread on metallic plates, so that they do not touch each other and are then introduced into it. An attendant called quayno, if expert, will prepare twenty-five pounds a day. The dried leaves are packed in cotton bags of a large size.

The people of South America attribute the most astonishing properties to the Mati, and use a very large quantity of it. If it be taken in moderation, it causes excitement and watchfulness, but if it be taken in excess, it produces drunkenness and tremors, resembling those induced by the abuse of spirituous liquors. Opium appears to cause opposite effects, and is therefore used as a remedy to obviate the injurious consequences induced by the Mati.

Dr Sigmond afterwards proceeded to lay before the society the results of a series of experiments on copaiba, conducted in Mr Battley's laboratory. From these it appears that trituration of the copaiba with magnesia, then making a tincture with proof spirit, and adding a little nitrous ether after filtering the spirit, affords the best preparation of the balsam. From one drachm to four, two or three times a day, is the dose.

Professor Johnson then delivered a lecture on the philosophy of botany, after which the meeting adjourned.—*Communicated by Mr Foote, one of the Secretaries.*

EDINBURGH.

Royal Society, March 21, 1836.—Rev. Dr Chamlers, V. P. in the Chair. Observations and experiments on the coloured and colourable matter in the leaves and flowers of plants, particularly in reference to the principles upon which acids and alkalis act in producing red and yellow or green, (continued from 18th January.) The paper terminated with the following general conclusion, that there exist in plants two distinct colourable principles, two species of chromogen, one which generates red compounds with acids, and denominated Erythrogen; and another which forms yellow compounds with alkalis, called Xanthogen. That these two principles occur together in red and blue flowers, and in the leaves of a few plants, which exhibit the former of these tints; that all green leaves, all white and all yellow flowers, and white fruits contain xanthogen alone; that litmus abounds in erythrogen but has no xanthogen; that the chromules of different tints may be generally considered distinct vegetable principles, or compounds having their own proper hue; sometimes intimately blended, or chemically combined with chromogen; at other times having no connection with it; that they are also occasionally, but not frequently, compounds of chromogen with acids or alkalis. The paper will be continued.

April 4, Dr Hope, V. P. in the Chair. Communication "On the newly discovered Microscopic Entozoon infesting the Muscles of the Human Body, by Dr Knox."

April 18, Sir T. M. Brisbane, President in the Chair. Mr Stark read a communication from Dr Parnell, on the occurrence of the Clupea alba or whitebait, and of the Raniceps trifurcatus or tadpole fish, in the Frith of Forth.

May 2, Sir T. M. Brisbane, President, in the Chair. Dr Knox exhibited some specimens to prove that the teeth of the Cachalot are devoid of enamel.—*Proceedings of Royal Society, Edinburgh*, No. 9.

Wernerian Natural History Society, March 12, 1836.—Robert Jameson, Esq. P. in the Chair. The Secretary read Dr Richard Parnell's account of the occurrence of the White-bait, *Clupea alba*, in the Frith of Forth, in considerable abundance; and also his description of the Sprat or Garvey-herring, *C. Sprattus*.

March 26.—David Falconar, Esq. formerly V. P. in the Chair. The Secretary read Dr Parnell's account of the Tadpole fish, *Raniceps trifurcatus*, and of the Sea-snail, *Cyclopteris liparis*, observed by him in the Frith of Forth, and specimens of both were exhibited. Mr Wilson, for the Secretary, then read Remarks on the Vitality of the Toad, communicated by the Rev. Edward Stanley of Alderley Rectory.

Dr Thomas Aitken gave an account of the anatomy of a specimen of the Ursine Sloth, *Ursus labiatus*, which died a short time ago in a travelling menagerie, while at Edinburgh, demonstrating the peculiarities of the organs of respiration and digestion. The stuffed specimen of the animal was also exhibited.

Professor Jameson exhibited a series of birds from Northern India, collected by Mr Hamilton Stirling, which, he remarked, was remarkably interesting, as presenting many species which were not known to exist in that quarter. Mr William Jameson pointed out several of these; of the rapacious order he noticed the Milvus govinda, and Accipiter dukhunensis, the former of which was considered to be probably the young of the Falco cheela. With regard to the geographic distribution of the genus Milvus, it was stated, that it occurs in all the different continents of the Old World and New Holland, but that it has not as yet been detected in the New World, its place being there supplied by the genus Nauclerus. Specimens of the Gypaetos barbatus were again laid before the Society, Professor Jameson having many years ago exhibited this bird sent from Northern India by Lieutenant Tytler (which, since that time, has been discovered by other travellers,) for the purpose of pointing it out under the form of the Vultur niger, it in the young state being considered as a distinct species, and described under this name; and also for the purpose of showing that it from the nest upwards, undergoes the same changes as the European specimens, a character, before all others, marking them to be one and the same species. In regard to British birds in general, in connection with Indian ornithology, Mr Jameson stated, that more than one-third of them occur in India, either identical with, or undergoing certain slight modifications in the colour of the plumage, size, &c., characters which, if their habits and manners are the same, would lead him to consider them rather as marked varieties than as new species. To the diurnal rapacious birds Mr Jameson particularly directed the attention of the Society, and stated, that of the 18 diurnal birds of prey found in this island, the following striking distribution was presented, viz. In common with Europe 3; Europe and Asia 2; Europe, Asia, and New Holland, 1; Europe, Asia, Africa, and New Holland, 3; Europe, Asia, and North America, 5; if, however, the Circus cineraceus exists in North America, which is not at all improbable, we shall have 6; Europe, Asia, and South America, 1; Europe and North America 3. To these conclusions, Mr Jameson remarked, he had come, principally from an examination of the magnificent collection of the Museum of the University of Edinburgh. After some other general observations on the identity of particular species of rapacious birds, in which it was stated, that the Falco cherrug of Gray, is the female of the Falco islandicus; the Circus pallidus, Sykes, the young male of the Circus cyaneus; the Circus variegatus, the Circus rufus,

&c.; Mr Jameson exhibited specimens of the Gallus bankiva in its various stages, and remarked, that it is probably one of the originals of the domestic fowl, which seems to have originated not from one, but from many species; Bucco grandis; Phasianus albo-cristatus in its various stages; Parus (Leiothrix) furcatus, Temminck; Cinclus Pallasii, Temminck. With regard to the characters assigned to the genus Leiothrix by Swainson, of which the Parus furcatus is the type, and which has been justly separated from the true Parianæ, some observations were made showing that several of these are quite inapplicable to the type of the genus. In exhibiting the Cinclus Pallasii, Mr Jameson remarked, that the genus was confined for many years to but one species, the existence of the Pallas Dipper being called in question, and that not found out of Europe. Now, however, we have three, and probably a fourth (a bird existing in the collection of the University of Edinburgh, which may be placed in this genus, or rather forms a connecting link between the genus Cinclus and that of Pitta,) some of which are found in all the great continents of the world, with the exception of New Holland. That the Cinclus Pallasii is the same as the Cinclus Americanus, an opinion advocated by L. Bonaparte, can only be maintained by those who have not had an opportunity of comparing the two species, being very apt to be misled, by the meagre description of the former by Temminck; one character alone, distinguishes the two species, viz. the Pallas Dipper is more than a third larger than the American; moreover, the latter never assumes the colour of the former, at least Mr Jameson was unable to detect, in a series of specimens of the Cinclus Americanus, in the Museum of the Universisy of Edinburgh, the slightest approach to the tinge of colour assumed by the Pallas Dipper. A specimen of Wryneck (Yunx torquilla) was exhibited, which was killed in February last in Fifeshire.—The Society adjourned till November.—*Ed. Phil. Journ.* No. 41. July 1836.

PROVINCIAL.

Shropshire and North Wales Natural History and Antiquarian Society,—instituted in November 1835, and opened with an address by the Ven. Archdeacon Butler, the first President. The terms are one guinea yearly, or ten guineas as a payment in composition. The branches of science to be promoted are subdivided, and curators appointed to superintend each department.

Antiquities, T. F. Dukes, Esq., and Mr Henry Pidgeon.
Botany, Rev. S. M. Wakefield, and T. W. Wilson, M. D.
Entomology, Rev. F. W. Hope, and W. W. Watkins, Esq.
Geology, Thos. Du Guord, M. D., and John Wayfield, Esq.
Mineralogy, Rev. J. M. Wakefield, and Mr S. Whitny.
Ornithology, T. C. Eyton, Esq., and Thomas Sutton, Esq.

The first general meeting was held in January 1836.

OBITUARY.

We regret to learn that the reports of the fate of Mr Richard Cunningham have proved too true. The following letter, which we copy from Loudon's Gardener's Magazine, will give the truest account of the melancholy occurrence, which took place after his separation from the expedition with which he was connected.—"The last arrival of mails from Sydney has put the government in possession of the report of the officer of police (Lieut. Zouch, 4th regiment,) who had been sent in command of a party of mounted police, to the

spot where my poor brother was last heard of, with a view of ascertaining his fate. A copy of the report (now before me) has been enclosed me by order of Lord Glenelg, (Colonial Secretary ;) and from it, it appears that after leaving Boree, on the present western verge of the colony, beyond Bathurst, Lieut. Zouch and party of troopers, accompanied by one of Major Mitchell's men, and a friendly native-black, named *Sandy*, proceeded to the N. W., towards the Bogan. On the third day of their advance (viz. the 2d of November last,) they fortunately met with two blacks, who knew all the particulars of a white man having been murdered on the Bogan: also the names and persons of the perpetrators of the deed ; and, as they offered to accompany the party to the country where the murderers were encamped with their tribe, Lieut. Zouch most gladly accepted their services as guides ; and, on the evening of the 6th, the party, by their directions, came upon a tribe consisting of upwards of forty men, women, and children, who were bivouacing on the banks of a lake fed by the Macquarie, and called the Budda. As no resistance was offered by these savages, they were immediately invested, and taken prisoners. A few questions produced an acknowledgment from them, that a white man had been killed by four of the tribe, on the Bogan, three of whom they delivered up ; and the fourth they stated, was absent on the Big River ; that is the Darling. On searching the bags of the tribe, the party found a knife, a glove, &c., which the three blacks acknowledged they had taken from the white man, and which the man who had been with Major Mitchell on his expedition, and now accompanied the police, said he was sure had belonged to my brother. The details of the closing scene of my poor relative's life are dreadful in the extreme, and, to those of his friends who had known his great benevolence of mind, his last moments can be more readily conceived than described !

" The officer goes on to report, that the three murderers, on being taken prisoners, admitted that, about six moons ago, they met a white man on the Bogan, who came up to them, and made signs that he was hungry ; that they gave him food ; and that he encamped with them that night. The white man repeatedly getting up during the night, excited their suspicion ; and, under the apprehension that he would betray them into the hands of some enemies in the neighbourhood, they consulted together, and soon came to the determination to destroy him ; which they effected the following morning, by one of the savages approaching him unperceived, and striking him on the back part of the head, and the others rushing upon him with their spears. This must have occurred about the latter end of April of the last year.

" The officer adds : ' I then determined to proceed to the spot where the murder was committed, which, I was informed by the blacks, was distant three days' journey ; but learning from them that there was a great scarcity of water, I deemed it advisable to take only a small party, consisting of three troopers, the man of Major Mitchell, and one of the prisoners (Bureemall) as a guide across to the Bogan ; leaving the remainder of the party, having the other two prisoners in charge, under the command of Corporal Moore, to proceed to a station about thirty miles distant from Wellington, there to await my return." Lieut. Zouch and his reduced party were now conducted to a place named Currindine, where the black showed him some bones, which, he said, were those of the white man they had killed ; and pointed out a small portion of a coat, and also part of a Manilla hat. Being thus convinced that they had reached the spot where the very melancholy event had occurred, the officer and his little party,

with true Christian-like feeling, collected all the remains they could discover; and having, in sad silence, deposited them in the ground, they raised a small mound over them, and barked some of the nearest trees, as the only means in their power of marking the spot whereon a man wholly devoted to science had, in the earnestness and zeal with which he was prosecuting botanical investigation (attached, as he was, to the explorative expedition of Major Mitchell,) been deprived of life, by the hands of mistaken savages!'

"Thus fell, in the very prime of life (having just completed his forty-second year), Richard Cunningham, an able botanist, and in other respects a very talented man; whose very amiable and obliging disposition had in his lifetime secured as much to him general esteem, as his premature, ever to be lamented death had produced a universal sentiment of unfeigned grief, in the minds of all his friends in England, and of every colonist in New South Wales.

"I have now given you the substance of the last official communication received from New South Wales, and which is a final one, regarding my poor brother; who, you will observe, was but one night living with the natives. We cannot tell what might have been the state of his mind on that night, which had urged him repeatedly to rise, walk about, and listen to catch the bark of dogs, or any little stir (amidst the dead stillness of midnight,) from the considerable encampment of his anxious sleepless companions, not far removed from him at the time! How dreadful must have been his feelings may be readily imagined. But, could he have composed himself, and not have risen and thus excited the suspicions of the savages among whom he was reposing, he probably would have been recovered, in a day or two, by his companions, who came to the native encampment but a day or so too late! He had a mind well disciplined by the religious education he had received; and, in perfect possession of his mental faculties, could soon have reconciled himself to a short lie in a remote desert, with savages, until rescued by his party: for he could say, with real feeling, and in firm belief in the existence of a merciful protecting Providence, in the desert and every where,—

'There is mercy in every place:
And mercy, *encouraging* thought!
Gives even affliction a grace,
And reconciles man to his lot.'

I can go no farther with you; but, standing relatively as I do, in this sad business, let me now for ever draw a veil upon the whole; just remarking, that two of the blacks found means to escape from the soldiers; and what has been done with the third, who was conveyed to Sydney, and there lodged in jail, is not known: for it appears very doubtful whether any evidence could be obtained, sufficient legally, to substantiate his guilt. Last December, the law officers had the case before them.—*A. C. Strand on the Green, Kew, June* 17, 1836."

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